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WATTERS (F. L.). **Value of cotton and jute flour bags in reducing infestation by the hairy spider beetle, *Ptinus villiger* (Reit.).**—*Cereal Chem.* 35 no. 4 pp. 317-321, 1 fig., 5 refs. St. Paul, Minn., 1958.

The following is virtually the author's summary. Experiments in flour storage warehouses with bags made from seven cotton fabrics and one of jute showed that finely woven, dyed or sized fabrics reduced infestation by *Ptinus villiger* Rtr. by about 90 per cent. Sacklets made from coarsely woven cotton or jute were heavily infested. There was a positive high correlation between fabric porosity and numbers of insects per bag.

DE WILDE (J.), DUINTJER (C. S.) & MOOK (L.). **Physiology of diapause in the adult Colorado beetle (*Leptinotarsa decemlineata* Say). I. The photoperiod as a controlling factor.**—*J. Insect Physiol.* 3 no. 2 pp. 75-85, 1 pl., 7 figs., 22 refs. London, 1959.

Experiments in which newly emerged adults of *Leptinotarsa decemlineata* (Say) were kept under conditions of 21, 25 or 28°C. [69.8, 77 or 82.4°F.] and 10, 15 or 20 hours light per day showed that diapause began 8-10 days after emergence in those kept at 25°C. and a photoperiod of 10 hours [*cf. R.A.E.*, A 47 358]; temperature appeared to play a minor rôle, and the effect of the short photoperiod was the same at 28°C. Diapause was also induced in darkness in adults from larvae reared under a photoperiod of 10 hours. Blinding adults had no influence on the effect of the photoperiod, but a constant supply of food was essential. Effects on the ovaries are described.

LIANG (Tung-ting) & LIN (Wen-fang). **Tests on the toxicity of some acaricides on the two-spotted spider mite (*Tetranychus telarius* Linne) on soybean (I).** [In Chinese.]—*J. agric. Ass. China* (N. S.) no. 23 pp. 22-34, 7 refs. Nanking, 1958. (With a summary in English.)

In laboratory tests in Formosa in March-July 1958, chlorobenzilate, Neovotran (a mixture of chlorfenson and Neotran (18:7)), EPN and Trithion in emulsion concentrates and Tedion and Kelthane in wettable powders were tested against *Tetranychus telarius* (L.). Infested soy-bean leaves were dipped in the acaricides, and the LD50's for the adults after 24 hours were 0.0019, 0.1143, 0.0005, 0.0002, 0.3885 and 0.0041 per cent., respectively; 0.025 per cent. Trithion and EPN had much the best residual effect, giving 88.4 and 98.4 per cent. kill, respectively, after 15 days. The eggs became less susceptible as they developed; at a concentration of 0.001 per cent., only Tedion was effective against young eggs, whereas at 0.034 per cent., all but Neovotran were fairly effective against all eggs. Kelthane, chlorobenzilate and Trithion caused the greatest reductions in percentage hatch of eggs deposited by treated females. About 95 per cent. or more mortality of larvae was given by 0.001 per cent. chlorobenzilate or Kelthane, 0.00067 per cent. EPN, 0.00034 per cent. Trithion or 0.034 per cent. Tedion or Neovotran.

In greenhouse tests, in which infested plants in pots received 10 cc. 0.034 per cent. spray 30 days after sowing, Tedion and Neovotran seemed less effective than the other materials for about 18 days, but were as effective as the others after about 33 days.

LIANG (Tung-ting) & LIU (Hsien-hsiu). **Tests on some insecticides against the paddy borer (*Schoenobius incertellus* Walker) larvae.** [In Chinese.] —Bull. Taiwan agric. Res. Inst. no. 18, 66 pp., 11 graphs, 20 refs. Taipei, Formosa, 1958. (With a summary in English.)

Schoenobius incertulas (Wlk.) is the most serious pest of rice in Formosa, and organic phosphates, in emulsions unless otherwise stated, were tested against the larvae in 1952-56.

At 0.0155 per cent. in sprays applied 20 days after transplanting, parathion gave better results against third-instar larvae than a mixture of parathion and malathion, which equalled diazinon and was followed by the progressively less effective azinphos-methyl (Gusathion), EPN, Trithion, Chlorthion, methyl-parathion, trichlorphon (Dipterex), dithiosystox [O,O-diethyl S-2-(ethylthio)ethyl phosphorodithioate] and methyl-demeton (Metasystox); the last and 1.5 per cent. methyl-parathion dust had practically no effect, and no synergism was shown by the mixture of parathion and malathion. When the plants were dipped in bundles in 0.0233 per cent. insecticide, larval mortality increased with the depth to which the plants were dipped, and was probably due to penetration of the chemicals rather than to their fumigant or systemic effects; when the leaves only were treated, demeton (Systox) was better and malathion worse than parathion or wetttable EPN. Residues from 0.025 per cent. azinphos-methyl, 0.05 per cent. parathion with malathion and 0.06 per cent. diazinon killed most newly-hatched larvae that were put on the leaves after four days, but not after eight, and at 0.04 per cent., endrin remained effective for 12 and 16 days on seedlings and half-grown plants, respectively, dieldrin lasted eight days and aldrin and DDT four days. Impregnated dusts containing 1-1.5 per cent. γ BHC showed more and those containing 10 per cent. DDT less residual effect than 1.5 per cent. endrin under indoor conditions, but none was effective in the open. When applied at 0.0233 per cent. 20 days after transplanting, parathion, the mixture and diazinon killed about 67 per cent. of the third-instar larvae in 24, 48 and 24 hours, respectively, and wetttable EPN killed 60 per cent. in 72 hours; parathion and EPN killed 97 and 99 per cent. of the first two instars in 24 and 72 hours, respectively; 40 days after transplanting, the three emulsions were most toxic to the larvae in the first two instars and tended to be progressively less so to those in the third, fourth and fifth. At a concentration of 0.05 per cent., they gave almost complete mortality of larvae inside the sheaths and moderate control of those within the stem, when sprayed on the leaf sheath, but practically none of either when only the leaf was dipped in the insecticide, and tests on plants of various ages confirmed that the insecticides should be applied to young plants or before the larvae had entered the stem. When stored in tightly closed bottles, parathion and the mixture showed a rapid loss of toxicity, and demeton showed a greater reduction than parathion after storage for three years. The toxicity of parathion appeared to be unaffected by temperatures of 20-32°C. [68-89.6°F.] and 70-90 per cent. relative humidity, but was reduced considerably at 16-22°C. [60.8-71.6°F.] and 66-72 per cent.; simulated rain, applied for an hour at 5.7 mm. per minute 30 minutes after spraying, caused no reduction in the toxicity of parathion, the mixture or diazinon. Parathion emulsion spray, applied to the stubble, gave no control of overwintering larvae.

In field tests in 1955-56, three applications of 0.025 per cent. endrin gave excellent control, and parathion, azinphos-methyl, diazinon and the mixture of parathion and malathion were almost as good, but trichlorphon in emulsion or wetttable-powder spray was less effective; a mixture of parathion and endrin was not promising.

WANG (H.) & CHEN (K. H.). **The occurrence of banana mealybug in south Taiwan and its control tests.** [In Chinese.]—Agric. Res. 6 no. 3 pp. 1-10. Taipei, Formosa, 1956. (With a summary in English.)

A survey in southern Formosa in 1954 showed that bananas planted near houses, bamboos or fruit trees such as *Citrus* were usually heavily infested by *Pseudococcus* sp., 85 per cent. of the mealybugs being on the pseudostems, mainly under the half-withered sheaths, and the remainder on the fruits. As the bananas are harvested during the dry spring and the mealybugs increase in dry weather, they greatly reduce the quality of the fruits. For control, the plants should be sprayed 3-4 times at monthly intervals; an emulsion spray of 0.1 per cent. malathion gave good control and could be combined with about the same amount of aldrin, which prolonged its effect, but caused slight injury to some of the young fruits; 0.125 per cent. malathion gave nearly 95 per cent. mortality.

LIANG (Tung-ting) & YU (Chiang-hai). **A study of the corn borer (*Pyrausta nubilalis*) on Ambari hemp in Taiwan.** [In Chinese.]—Agric. Res. 6 no. 4 pp. 15-40, 1 pl., 1 fig., 91 refs. Taipei, Formosa, 1957. (With a summary in English.)

LIANG (Tung-ting) & TSAI (Yung-peng). **A study for controlling corn borer (*Pyrausta nubilalis*) on Ambari hemp.** [In Chinese.]—Op. cit. 7 no. 2 pp. 55-66, 1 graph, 1 fldg. table, 10 refs. 1957. (With a summary in English.)

In the first of these papers, the authors report that *Ostrinia* (*Pyrausta*) *nubilalis* (Hb.) is the most important pest of Ambari hemp (*Hibiscus cannabinus*) in Formosa, the first of the five annual generations being the most injurious. Plants sown in early April are severely attacked between late May and mid-June; those sown in late April are less damaged, and those sown in early May are attacked by the second generation between mid-July and early August. The eggs are laid on the leaves, and the larvae at first feed gregariously on the lower surfaces of the leaves and then disperse and bore in the stems. *Xanthopimpla stemmator* (Thnb.), the only important natural enemy, affords about 12-26 per cent. parasitism.

Experiments on control are described in the second paper. In laboratory tests of emulsion sprays containing 0.0049 per cent. toxicant, endrin and parathion (Folidol) were highly toxic to larvae in the first three instars, dieldrin and azinphos-methyl (Gusathion) less so and DDT and γ BHC (lindane) relatively ineffective; none affected larvae in the fourth or fifth instar. For newly hatched larvae, parathion, endrin and azinphos-methyl had LD₅₀'s of 0.0002, 0.0008 and 0.0049 per cent., respectively. Endrin had a good residual effect, both indoors and out, for 13 days, whereas parathion was ineffective after five days outdoors; azinphos-methyl was less effective than endrin, but, under outdoor conditions, 0.0163 per cent. endrin and 0.0277 per cent. azinphos-methyl gave about 80 per cent. control after nine days; in field tests in 1955 and 1956, endrin in emulsion spray was more effective than wettable dieldrin, parathion emulsion or azinphos-methyl emulsion.

Tests of maize as a trap crop showed that it was very effective when sown on each side of a hemp field, over 1 per cent. of its area. Sowing it 26 days before the hemp gave the best results, but is not generally practicable, and sowing the two crops at the same time and destroying the trap crop after 30-45 days, in about mid-June, was also effective, particularly when 1-2 applications of endrin emulsion spray were made to the nearest five rows of hemp after removal of the trap crop.

CHIU (S. C.) & CHENG (H. H.). **A field survey of the population density of the pineapple mealybug and red-mite in Formosa (Taiwan).** [In Chinese.]—*Agric. Res.* 6 no. 4 pp. 41-57, 1 ref. Taipei, Formosa, 1957. (With a summary in English.)

Dysmicoccus brevipes (Ckll.) and *Stigmæus floridanus* Banks are the commonest and most important pests of pineapple in Formosa, and an intensive field survey of their population density was made at 11 localities in the southern and central districts in April-May 1952. Examination of 517 plants, selected at random, showed that 298 were infested by *D. brevipes*, with an average of 35.71 mealybugs per plant, about a third occurring on the leaf-bases, a third on the root system and small numbers on the fruits and fruit pedicels. The density of the population was generally significantly lower in fields facing west than in those facing south and also where the plants had been fumigated before transplanting. Examination of the five outer leaves of each plant showed that 416 were infested by the mite, the infested area averaging 316 sq. mm. per plant; population density appeared to be correlated with soil humidity.

LIANG (Tung-ting) & LIU (Hsien-hsiu). **Tests on toxicity of DDT, BHC and lindane dusts against *Dicladispa armigera similis* Uhmann.** [In Chinese.]—*Agric. Res.* 7 no. 2 pp. 23-31, 3 figs., 1 ref. Taipei, Formosa, 1957. (With a summary in English.)

Chlorinated-hydrocarbon insecticides were tested as dusts against adults of *Dicladispa similis* (Uhmann) on rice in Formosa in 1950-53. In the laboratory, 40.5 lb. 5 per cent. DDT or 0.5 per cent. γ BHC and 31.5 or 22.5 lb. 1 per cent. γ BHC were as effective as 22.5 lb. 10 per cent. DDT per acre, and at 31.5 lb. per acre, 10 per cent. DDT remained effective for 12 days and 1 per cent. γ BHC for 8-9 days. The results of field tests were variable, being affected by weather conditions and methods of application.

CHENG (K. H.). **Banana corm weevil and its control experiments.** [In Chinese.]—*Agric. Res.* 7 no. 2 pp. 45-54, 9 refs. Taipei, Formosa, 1957. (With a summary in English.)

Investigations over a period of four years in Formosa on *Cosmopolites sordidus* (Germ.), a serious pest of banana, showed that the egg, larval and pupal periods averaged 6.3, 27.3 and 5.6 days, respectively, and that, although all stages were present together, first-instar larvae were most abundant in March, May, July and October, indicating that there are about four generations a year in the south. The weevil is widespread, infestation averaging 82.61 and 2.84 per cent. in central and southern Formosa, respectively, corresponding to the age of the plantations. In tests, emulsion sprays of aldrin or dieldrin gave very good control and were better than DDT. A mixture of aldrin and dieldrin (1:2) prevented damage in the field in 1954, and a dieldrin wettable-powder spray showed good residual properties in the laboratory. Tests in a heavily infested plantation in 1954-55 showed that 0.05 per cent. wettable dieldrin gave the best and aldrin and endrin emulsions good control when applied twice a year to the suckers, after the old stools had been cut off, and to cut pieces of corm [cf. *R.A.E.*, A 47 284, etc.].

YANG (V. L.), YAO (G. F.), CHANG (T. W.) & WAN (Z.). **Studies on *Parnara guttata* Bremer et Grey. I. Testing the number of generations of *Parnara guttata* B. et G. by the method of "thermal sums".** [In Chinese.]—*Acta ent. sin.* 9 no. 2 pp. 137–148, 11 refs. [Peking] 1959. (With a summary in English.)

Parnara guttata (Brem.) is one of the most important pests of rice in China. The threshold temperatures and thermal constants for the development of its various stages and a complete generation in the field were computed and are given.

HSU (Chin-fung), FENG (Chen) & MA (Shou-liu). **A preliminary study on the utilization of the fungus, *Beauveria bassiana* (Bals.) Vuill. to control the soy-bean pod borer (*Grapholitha glyciniivorella* Mats.).** [In Chinese.]—*Acta ent. sin.* 9 no. 3 pp. 203–217, 1 pl., 2 figs., 32 refs. [Peking] 1959. (With a summary in English.)

The larvae of *Cydia (Grapholitha) glyciniivorella* (Mats.), which attack the pods of soy bean in China, are infested by *Beauveria bassiana*, the percentage sometimes reaching 30. In observations on the fungus in 1954–57, the optimum conditions for its development were a temperature of 21–28°C. [69.8–82.4°F.] and a relative humidity above 95 per cent. Spore dusts were prepared in various ways and tried in the field. The percentages of larvae that became infested were 70–100 in small-plot tests and 30–36 in larger ones; in the latter, the emergence of adults was reduced by about 50–70 per cent.

CHIEN (Ting-yu). **Studies on the bagworm, *Chalia laminati* Heylaerts of *Aleurites* spp.** [In Chinese.]—*Acta ent. sin.* 9 no. 3 pp. 224–233, 16 figs., 7 refs. [Peking] 1959. (With a summary in English.)

The larvae of *Kotochalia (Chalia) laminati* (Heyl.) damage the leaves, bark and husks of *Aleurites* spp. in the Chinese provinces of Fukien, Chekiang and Hunan. The Psychid has only one generation a year in northern Fukien and overwinters in the larval stage. Only the adult males are winged. The females lay their eggs in the cases, at the rate of 270–430 per female, and the first-instar larvae are usually found on the lower surfaces of the leaves and on the top of the plants. A spray of γ BHC in June–July gave promising control.

KOIZUMI (K.). **On four Dorilaid parasites of the green rice leafhopper, *Nephrotettix cincticeps* Uhler (Diptera).**—*Sci. Rep. Fac. Agric. Okayama Univ.* no. 13 pp. 37–45, 4 figs. Okayama, 1959. (With a summary in Japanese.)

The author gives a list of the hitherto known natural enemies of *Nephrotettix apicalis cincticeps* (Uhl.) on rice in Japan, and describes three new Pipunculids from adults reared from this Cicadellid in Honshu and Shikoku as *Tömösváryella oryzaetora*, *Dorilas tsuboi* and *D. orientalis*, spp.n. He also describes *D. cruciator* (Perkins), which parasitises *N. cincticeps* in the same parts of Japan and also occurs in Formosa and Australia.

WONG (H. R.). **Preliminary notes on the life history of *Herculia thymetusalis* Wlk.**—*Bi-m. Progr. Rep. For. Biol. Div. Can.* **16** no. 1 p. 3. Ottawa, 1960.

In preliminary laboratory studies on the life-cycle of *Herculia thymetusalis* (Wlk.), one of the commonest of the complex of insects infesting the tops of black spruce [*Picea mariana*] in Manitoba and Saskatchewan [cf. R.A.E., A **48** 527], the larvae hatched in 7–10 days, passed through seven instars, overwintering twice, in the fourth and seventh, and pupated in May and early June after the second winter; the adults emerged between late May and July. In the field, fifth- and sixth-instar larvae probably also overwinter.

THOMSON (M. G.). **Egg sampling for the western hemlock looper.**—*For. Chron.* **34** no. 3 pp. 248–256, 2 refs. Toronto, 1958.

The distribution of eggs of *Lambdina fiscellaria lugubrosa* (Hulst.) on western hemlock [*Tsuga heterophylla*] in British Columbia was studied, and the following is based on the author's abstract of this account of the results. The females lay eggs on all parts of the tree, but in the years prior to heavy defoliation the greatest numbers are found on the bole in the mid-crown. Moss and lichen are the preferred oviposition sites, but many eggs are laid singly in bark crevices. Where ten or more eggs per 0.5 sq. ft. sample of bark are found in the mid-crown, noticeable defoliation may occur in the next summer.

BROWN (G. S.), RANDALL (A. P.), LEJEUNE (R. R.) & SILVER (G. T.). **Black-headed budworm spraying experiments on Vancouver Island, British Columbia.**—*For. Chron.* **34** no. 3 pp. 299–306, 1 graph, 1 ref. Toronto, 1958.

The following is based on the authors' abstract. Aerial spraying experiments were carried out against *Acleris variana* (Fern.) on western hemlock (*Tsuga heterophylla*) in Vancouver Island in 1956 to determine the effectiveness of DDT sprays against the different larval stages, dosage requirements, and time of application. Two series of plots were sprayed, the first against the early-instar larvae and the second against late-instar larvae. Each series received dosages of 1 lb. DDT in 1 gal. oil per acre or 0.5 lb. DDT in 0.5 gal. oil per acre. Excellent control of larvae in all stages was given by the two dosage rates, the degree of control being more closely related to droplet density than to dosage. The best time to begin spraying for maximum foliage protection is when most larvae are in the second instar.

KRING (J. B.). **Predation and survival of *Limonius agonus* Say (Coleoptera: Elateridae).**—*Ann. ent. Soc. Amer.* **52** no. 5 pp. 534–537, 2 figs., 19 refs. Washington, D.C., 1959.

The following is virtually the author's summary. Cannibalism among newly hatched, confined larvae of *Limonius agonus* (Say) suggested that survival might be dependent on an animal meal in the early instars and that lack of such food might account for previous failures to rear these larvae in isolation. In the tests described, isolated, newly hatched larvae were offered dried liver, sugar, yeast, honey, potato, potato roots and dissected

or whole insects. They fed on all these foods (except Collembola), but moulted only when animal food was provided. In contrast, larvae of the non-cannibalistic *Agriotes mancus* (Say) fed on all foods except insects and moulted only when plants were provided. As a possible test of predation in the field, *L. agonus* and another cannibalistic wireworm, *Ctenicera tarsalis* (Melsh.), were compared with two non-cannibals, *A. mancus* and *Melanotus* sp., for the amounts of potassium and sodium in the whole body. The cannibalistic species had less of both these elements than did the plant feeders, but in all four species the potassium content was greater than the sodium content.

DAVIS (G. R. F.). **Effects of sterilized soil and of starvation on growth and survival of larvae of *Ctenicera aeripennis aeripennis* (Kby.) (Coleoptera: Elateridae).**—*Ann. ent. Soc. Amer.* **52** no. 5 pp. 537-539, 11 refs. Washington, D.C., 1959.

The following is virtually the author's summary. Larvae of *Ctenicera aeripennis aeripennis* (Kby.) kept without food survived as well in sterilised as in unsterilised soil for 40 weeks; at 60 weeks, 77 per cent. of the larvae survived in unsterilised soil and 32 per cent. in sterilised soil. They lost more weight in sterilised than in unsterilised soil. Measurements of cast skins of larvae that moulted more than once indicated that five larvae increased in size, 12 remained the same and one became smaller. These findings support the theory that the occurrence of moulting and the number of moults in insects are not rigidly regulated.

DAVIS (G. R. F.). **Growth and feeding behaviour of larvae of the Puget Sound wireworm, *Ctenicera aeripennis aeripennis* (Kby.), (Coleoptera: Elateridae) on carrot slices and seeds of wheat, flax, barley, rye, and alfalfa.**—*Ann. ent. Soc. Amer.* **52** no. 5 pp. 540-543, 2 refs. Washington, D.C., 1959.

The following is virtually the author's summary. In tests, medium-sized larvae of *Ctenicera aeripennis aeripennis* (Kby.) (2.5-78.7 mg.) fed most frequently on rye or wheat, less on carrot or flax, and least on barley, lucerne or a combination of the six foods. Large larvae (81-182.3 mg.) fed most frequently on rye or wheat, less on flax and least on lucerne, carrot, barley or a combination. When provided with all six foods, medium-sized larvae ate three foods as often as one, and large larvae a single food more often than a combination; the three foods selected most often by medium-sized larvae were wheat, rye and carrot. Differences in feeding, moulting and change in weight between larvae of different sizes, and between larvae of this subspecies and *C. destructor* (Brown) are discussed [cf. *R.A.E.*, A 47 91].

BEAN (J. L.). **Frass size as an indicator of spruce budworm larval instars.**—*Ann. ent. Soc. Amer.* **52** no. 5 pp. 605-608, 2 figs., 4 refs. Washington, D.C., 1959.

Observations were made in Minnesota to ascertain whether frass falling to the ground from larvae of *Choristoneura fumiferana* (Clem.) feeding on balsam fir [*Abies balsamea*] could provide an index of the instars of the larvae present, and the following is the author's summary of the results.

Frass width, but not its length or volume, shows correlation with the various larval instars. The mean width, and the standard deviation, for each instar are tabulated. Frass, collected in cone-shaped cloth traps in the field, can be used as an index of the percentage of larvae in each instar present when the collection is made.

VAN DEN BOSCH (R.) & DIETRICK (E. J.). **The interrelationships of *Hypera brunneipennis* (Coleoptera: Curculionidae) and *Bathyplectes curculionis* (Hymenoptera: Ichneumonidae) in southern California.**—*Ann. ent. Soc. Amer.* **52** no. 5 pp. 609-616, 4 figs., 15 refs. Washington, D.C., 1959.

The following is based on the authors' abstract. *Hypera brunneipennis* (Boh.) infests lucerne in three of the four major producing areas in the desert of southern California and in much of the south coastal plain. The larvae are parasitised by *Bathyplectes curculionis* (Thoms.), which was introduced into Arizona and spread from there in bales of lucerne hay or by natural means. This Ichneumonid destroys about one-third of the weevil population annually in the coastal areas, but is of little significance in the desert valleys. Parasitism was found to be prevented from increasing by a lethal action of the blood of the weevil on the parasite eggs. This indicates that the strain of the parasite present, which was derived from *H. variabilis* (Hbst.) (*postica* (Gylh.)), is not wholly adapted to *H. brunneipennis*. Individual larvae of the latter appear to have limited ability to inactivate the eggs, so that one or more of the latter may survive in superparasitised hosts. A more fully adapted strain might be obtainable from a Near Eastern country.

CHIANG (H. C.). **Survival of European corn borer larvae, *Pyrausta nubilalis* (Hubn.) in artificial tunnels in stalks of field corn, *Zea mays* L.**—*Ann. ent. Soc. Amer.* **52** no. 5 pp. 631-632, 1 fig. Washington, D.C., 1959.

Studies are described showing that larvae of *Ostrinia* (*Pyrausta*) *nubilalis* (Hb.) can survive and develop after being transferred to tunnels made artificially in the stalks of maize. Uses to which the technique could be put are noted.

WRIGHT (C. G.). **The influence of several environmental factors on the development of the southern *Lyctus* beetle, *Lyctus planicollis* LeConte.**—*Ann. ent. Soc. Amer.* **52** no. 5 pp. 632-634, 2 graphs, 5 refs. Washington, D.C., 1959.

In tests in the laboratory at about 31°C. [87.8°F.] and 85 per cent. relative humidity, adults of *Lyctus planicollis* Lec. were confined with pieces of heat-dried red and white oak [*Quercus falcata* and *Q. alba*] and air-dried red oak placed on sand in jars. The red-oak series were exposed to 0 or 15 hours light per day, and the white-oak one to 15 hours. There was little difference in the duration of development of the beetle progeny, the numbers of days to the first emergence being 68-76 and averaging 70.6 for males and 71.4 for females, but twice as many beetles emerged from air-dried red oak exposed to 15 hours light as from that kept in the dark and over three times as many as from the other samples. The percentage moisture content of uninfested wood kept in the laboratory was 9.32 for air-dried red oak, 7.87 for heat-dried red oak and 7.92 for heat-dried white oak.

BISHOP (G. W.). **The comparative bionomics of American *Cryptolestes* (Coleoptera—Cucujidae) that infest stored grain.**—*Ann. ent. Soc. Amer.* **52** no. 6 pp. 657–665, 18 refs. Washington, D.C., 1959.

The three species of *Cryptolestes* of importance as pests of stored grain in the United States are *C. ferrugineus* (Steph.), *C. pusillus* (Schönh.) (*minutus* (Ol.)) and *C. turcicus* (Grouv.) [cf. *R.A.E.*, A **46** 42]. A survey of the northern grain-growing areas showed that *C. ferrugineus* is the most abundant, and that *C. turcicus* is much more common than *C. pusillus*. In studies on the bionomics of these Cucujids, which are recorded in detail, *C. ferrugineus* was the least sensitive to low humidities, in both the adult and larval stages. Egg-production and length of adult life increased sharply as relative humidity was increased from 40 to 90 per cent., and *C. pusillus* was more susceptible to low temperatures than the others, which were about equally tolerant. The habits of the three species in general were similar.

FLOYD (E. H.) & NEWSOM (L. D.). **Biological study of the rice weevil complex.**—*Ann. ent. Soc. Amer.* **52** no. 6 pp. 687–695, 4 figs., 18 refs. Washington, D.C., 1959.

From a review of the literature and their own investigations in the United States [cf. *R.A.E.*, A **48** 130, etc.], the authors agree that two species of rice weevils have been confused under the name *Sitophilus oryzae* (L.), a large one and a small one. Since the Linnaean specimens have apparently been lost, it is uncertain to which of them the name should be applied. European workers have in general applied it to the small one, and Japanese workers to the large one, and the authors accept the latter view, using the name *S. oryzae* (with synonyms *S. zea-mais* Motsch. [cf. **23** 348] and *Calandra oryzae* var. *platensis* Zacher [cf. **12** 41]) for the large one and *S. sasakii* (Tak.) for the small one, for which the common name “lesser rice weevil” is proposed; the varietal name *S. oryzae* var. *minor* applied to the small form by Sasaki [cf. **48** 130] has no nomenclatorial standing.

In a study of material from various parts of the United States, the coloration of the two species was variable, their measurements overlapped, and no practical external morphological distinctions were found, but the two species differed in the eighth sternum of the female and in the shape of a sclerite on the dorsal surface of the aedeagus of the male. Reproduction of both species was least in maize, next in rough rice and greatest in grain sorghum; that of *S. oryzae* was greater in unpolished rice than in wheat, whereas the reverse was the case for *S. sasakii*. When both species were confined on maize or unpolished rice, *S. oryzae* proved to be the dominant species, whereas *S. sasakii* became dominant in wheat. The size and colour of both species was influenced by the grain in which they developed. Cross-breeding tests showed that they are reproductively isolated, no pairing being observed and no sperm transferred.

Examination of grain samples showed that, although *S. sasakii* was present throughout the southern United States, *S. oryzae* was much commoner there; only *S. sasakii* was found in samples from the more northerly States. This was in contradiction of the known temperature preferences, *S. sasakii* being favoured by high temperatures, and is probably a result of the distribution of the preferred grain species.

MIDDLEKAUFF (W. W.). **Some biological observations on *Sarcophaga falciformis*, a parasite of grasshoppers (Diptera: Sarcophagidae).**—*Ann. ent. Soc. Amer.* **52** no. 6 pp. 724-728, 9 figs., 6 refs. Washington, D.C., 1959.

The following is virtually the author's abstract. *Sarcophaga falciformis* Aldr. was found parasitising *Melanoplus devastator* Scud. and *Oedaleonotus enigma* (Scud.) on rangeland in California in 1958. The female viciously attacks adults and older nymphs of these grasshoppers, and inserts a larva through the cuticle into the muscles of the hind femur. The larva migrates into the thoracic cavity, where it matures in six days. The host dies when the fly emerges, or soon after. The last generation of the fly overwinters as larvae in the soil. *S. falciformis* reduced one localised, heavy population of *M. devastator* almost to vanishing point.

OATMAN (E. R.). **Host range studies of the melon leaf miner, *Liriomyza pictella* (Thomson) (Diptera: Agromyzidae).**—*Ann. ent. Soc. Amer.* **52** no. 6 pp. 739-741, 2 refs. Washington, D.C., 1959.

Liriomyza pictella (Thoms.) mines the leaves of many cultivated and uncultivated plants in California [cf. *R.A.E.*, A **48** 511]. Studies on its food-plant range, carried out in 1955, showed that the life-cycle was completed on 54 out of 71 cultivated and wild species tested. Lists of these are given, showing for the 54 the degree to which the leaves were mined.

LAWSON (F. R.). **The natural enemies of the hornworms on tobacco (Lepidoptera: Sphingidae).**—*Ann. ent. Soc. Amer.* **52** no. 6 pp. 741-755, 3 figs., 37 refs. Washington, D.C., 1959.

The following is based on the author's abstract. The known natural enemies of *Protoparce sexta* (Joh.) and *P. quinquemaculata* (Haw.) on tobacco in the United States are listed, and an account is given of a survey of those that occur in North Carolina. The most important were *Jalysus spinosus* (Say), which preys on the eggs, *Polistes fuscatus* (F.) and *P. exclamans* Vier., which are predators of the larvae, and *Apanteles congregatus* (Say), which parasitises the larvae, both species being attacked. Two Tachinid parasites were seldom of more than minor importance. In 37 populations of the two species of *Protoparce*, the average mortality due to natural enemies was nearly 98 per cent. More than half of this was due to *Polistes*, which killed a high percentage of the parasites with their hosts. Mortality varied with time and place, but the proportions due to the different enemies remained about the same.

KOEHLER (C. S.) & GYRISCO (G. G.). **Studies of the vertical distribution of the clover root borer in roots of red clover in relation to progression of the season.**—*Ann. ent. Soc. Amer.* **52** no. 6 pp. 760-762, 2 graphs, 2 refs. Washington, D.C., 1959.

The following is based on the authors' abstract of this account of investigations in New York in 1957. Roots of red clover (*Trifolium pratense*)

were sampled periodically from a second-year field, cut into half-inch segments, beginning at the top of each root, and examined for the various stages of *Hylastes (Hylastinus) obscurus* (Marsham). From 12th June to 12th October, the seasonal average depths at which the insects were found were 0.76 in. for larvae, 0.84 in. for pupae and 0.82 in. for adults, taken after the first callow individual appeared. The pooled average depth of these stages increased in a linear manner as the season progressed. When head-capsule width was used as a criterion of size, the depth of the larvae collected on 22nd August was directly proportional to their size. Temperature appeared not to be a controlling factor for the depth at which the combined stages were found. In the absence of a temperature effect, maturity seemed to be the factor that had the greatest influence on the depth of the larvae.

ROLSTON (L. H.), NEISWANDER (C. R.), ARBUTHNOT (K. D.) & YORK (G. T.).

Parasites of the European corn borer in Ohio.—*Res. Bull. Ohio agric. Exp. Sta.* no. 819, 36 pp., 21 figs., 20 refs. Wooster, Ohio, 1958.

The following is based on the authors' summary. Exotic parasites for the control of *Ostrinia (Pyrausta) nubilalis* (Hb.) on maize were first colonised in Ohio in 1924, three years after it was discovered in the State. Additional releases were made annually until the end of 1936 and intermittently until 1949 [cf. *R.A.E.*, A **31** 288-289]. Of the 18 species of parasites released, three, *Lydella stabulans griseescens* R.-D., *Angitia (Horogenes) punctoria* Roman and *Sympiesis viridula* (Thoms.), became established. *Lydella* is the most important numerically, although *Angitia* may predominate in localised areas. A few examples of *Sympiesis* appear infrequently in collections of *Ostrinia* larvae. Both *Lydella* and *Sympiesis* appear to be generally distributed, while *Angitia* has been taken only in the north-western and central-western counties. *Chelonus annulipes* Wesm. [cf. **31** 289] persisted for ten years in the vicinity of one colony site, but has not been recovered since 1948. Five species of native parasites have been reared from *Ostrinia* larvae, but not in sufficient numbers to be of importance.

CANCIENNE (E. A.). **Fire ant control: effects on the sugar cane borer.**—

Sug. J. **22** no. 11 p. 17. New Orleans, La., 1959.

Eradication measures against the imported fire ant [*Solenopsis saevissima richteri* Forel], which has been present for 15 years in Louisiana, were begun in October 1957. Applications of 20 lb. 10 per cent. heptachlor granules per acre, made by aeroplane or ground machine, had given excellent results over a large area by the end of 1958, but resulted in an unexpected increase of the sugar-cane borer [*Diatraea saccharalis* (F.)]. Applications in May and June had controlled this pest, but populations were higher in treated than in untreated cane fields in August; examination in October showed averages of 58.84 and 41.12 per cent. internodes bored in treated and untreated fields, respectively, and it is concluded that the insecticide killed predators as well as *D. saccharalis* and that reinfestation by the latter from untreated fields was responsible for the increase. Fields in which rymania was applied after the heptachlor remained heavily infested, but those treated with endrin had very low populations, and this compound is recommended for use after heptachlor treatment.

GRIGARICK (A. A.). **Bionomics of the rice leaf miner, *Hydrellia griseola* (Fallen), in California (Diptera: Ephydriidae).**—*Hilgardia* 29 no. 1 pp. 1-80, 50 figs., 60 refs. Berkeley, Cal., 1959.

The larvae of *Hydrellia griseola* (Fall.) were reported as mining the leaves of rice in California in 1922 and caused extensive damage throughout the Sacramento and San Joaquin valleys in May and June 1953. The author gives short descriptions of all stages of the Ephydrid, discusses its food-plants and distribution and describes laboratory and field investigations on its bionomics, carried out in 1954-56. The following is based largely on his summary of the results.

The adults were active at rain pools bordered by grass in late January or early February, and oviposition and leaf-mining steadily increased in these areas until the pools began to dry up in late March; pupation began in the second half of March, and adult emergence in the first half of April. Rice is usually sown between 15th April and 10th May, after the ground has been cultivated and irrigation water brought to the area in preparation for flooding. The second generation of *H. griseola* usually occurred on grasses by the irrigation water, and adult emergence began about mid-May, when the rice plants were beginning to appear above water. The adult population and rate of oviposition were greatest at that time, and up to three generations were observed on the rice, with adults emerging mainly in late May, June and July, respectively, but they were successively smaller, owing to adverse maximum temperatures, parasitism and rapid plant growth. The adult population and oviposition rate were quite low by early July, and activity was almost entirely restricted to the cooler water-inlet areas, where water temperatures remained about 67°F. There were probably four more generations, completed mainly on bearded grass (*Polypogon monspeliensis*), before the rice-fields were drained in September. Falling autumn temperatures permit a dispersal to more permanent aquatic areas, where a further generation was usually completed on grasses by late November. Adults were observed in November-January and were presumably the main overwintering forms. The larvae and pupae were parasitised by 12 species of Hymenoptera in four families, the most abundant being *Chorebus aquaticus* Mues., *Opis hydrelliae* Mues. and *Halticopelta* sp.

Laboratory tests showed that the adults had a decided preference for low temperatures and high moisture conditions; they remained alive for 42 days at 28°F. but died after 4-5 minutes at 108°F. The maximum length of life at room temperature (49-76°F.) was 146 days. The total developmental period ranged from 92.7 days at 50°F. to 13.8 days at 90°F.

A general survey for damage should be made before chemical control is recommended, as infestation is not generally uniform throughout a field. Treatment is most effective if carried out just after the rice has appeared above the water, and dieldrin or heptachlor at 4 oz. per acre in an emulsion concentrate is usually applied by aeroplane, with due regard to the danger to fish and wild life.

KLOSTERMEYER (E. C.). ***Lygus* bug and pea aphid control experiments on alfalfa grown for seed.**—*Stas Circ. Wash. agric. Exp. Stas* no. 338, 7 pp., multigraph. [Pullman, Wash.] 1958.

The following is based on the author's summary. Insecticides were tested in emulsion sprays for the control of *Lygus* spp. and the pea aphid [*Macrosiphum pisum* (Harris)] on lucerne grown for seed at several places

in central Washington in 1957. Two applications of toxaphene at 3 lb. per acre resulted in adequate and fair control, respectively, but DDT failed to give satisfactory results except at one place. Endrin, followed by an application of DDT or toxaphene, controlled both insects. The addition of either demeton or parathion to DDT or toxaphene resulted in effective control of the aphid.

EATON (C. B.). *Observations on the survival of *Arhopalus productus* (LeConte) larvae in Douglas-fir lumber (Coleoptera: Cerambycidae).*—*Pan-Pacif. Ent.* 35 no. 2 pp. 114-116, 2 refs. San Francisco, Cal., 1959.

The Cerambycid, *Arhopalus productus* (Lec.), infests the wood of dead or dying Douglas firs [*Pseudotsuga menziesii*] in the United States [cf. *R.A.E.*, A 33 40], and the larvae can survive and develop normally in timber used in building. Emergence of adults is usually reported within a year of construction, although the beetles are thought normally to require several years for development, but the progressive drying of the wood probably reduces survival. In a test, two pieces of moist infested wood from recently killed trees in California were kept indoors from 16th November 1955 to 27th December 1956, and the growth of eight larvae in them was noted; only one completed its development, the adult (a male) emerging after seven months. The moisture content of the wood gradually fell to about 10 per cent., and the larvae became progressively less active as it did so.

WARREN (L. O.) & COYNE (J. F.). *The pine sawfly, *Neodiprion taedae linearis* Ross, in Arkansas.*—*Bull. Ark. agric. Exp. Sta.* no. 602, 23 pp., 6 figs., 5 refs. Fayetteville, Ark., 1958.

The following is substantially the authors' summary. *Neodiprion taedae linearis* Ross [cf. *R.A.E.*, A 46 264] has been a pest of loblolly pine (*Pinus taeda*) and short-leaf pine (*Pinus echinata*) in Arkansas for several years, the former being preferred. The sawfly has one generation a year and overwinters in the egg-stage in the needles. The larvae hatch between the end of February and the beginning of April and feed for 3-4 weeks. Summer is passed in a cocoon in the soil, and pupation occurs about two weeks before adult emergence, which takes place in late September, October or early November. The adults live for 1-9 days under cage conditions, with an average of 3.85 days. Mating takes place soon after emergence, and oviposition occurs shortly afterwards, the females depositing an average of 71.4 eggs each. High temperatures in December-February shorten the egg stage, which lasts 154-175 days in northern Arkansas, and cool, wet and cloudy weather prolongs the hatching period and results in a longer larval feeding period, but inhibits adult activity and reduces the number of eggs laid.

Outbreaks are usually checked by natural factors, such as weather, parasites and diseases, but this may not occur until considerable damage has been done. Although attacked trees may suffer loss of growth, this is usually not sufficient to warrant chemical control unless severe defoliation persists for year after year in the same stand. When properly timed, a spray of 1 lb. DDT in about 2 U.S. gal. oil per acre applied from the air gives excellent control.

ROCHOW (W. F.). **The role of aphids in vector specificity of barley yellow dwarf virus.**—*Plant. Dis. Rept.* **42** no. 8 pp. 905-908, 3 refs. Washington, D.C., 1958.

The following is based on the author's summary. Colonies of *Rhopalosiphum fitchii* (Sand.) and *Macrosiphum avenae* (F.) (*granarium* (Kby.)) from the States of Washington and New York were compared on oats as vectors of five 'vector-specific' isolates of the barley yellow-dwarf virus from oats in New York [cf. *R.A.E.*, A **48** 417, 418]. The tests involved acquisition feeding on detached half-leaves or the rearing of aphids on virus source plants. Virus transmission by *R. fitchii* from New York and Washington was identical in all but one of 16 comparisons. Transmission by *M. avenae* from the two areas was identical in all but three of 20 tests. These results are considered as evidence that the observed vector specificity is due to the virus and not the aphid vector [cf. next abstract].

BRUEHL (G. W.). **Comparison of eastern and western aphids in the transmission of barley yellow dwarf virus.**—*Plant. Dis. Rept.* **42** no. 8 pp. 909-911, 8 refs. Washington, D.C., 1958.

The following is based on the author's summary. *Rhopalosiphum fitchii* (Sand.) and *Macrosiphum avenae* (F.) (*granarium* (Kby.)) collected in New York and Washington were compared as vectors of 28 collections of the Washington barley yellow-dwarf virus in oats and other cereals [cf. preceding abstract, etc.]. Aphids of each colony transmitted all the virus strains. These results show that the Washington strains have for the most part little or no vector specificity as regards these aphids. Aphids from New York were as effective as those from Washington, and the prevalence of 'vector-specific' strains in New York and their absence in Washington must result from a regional difference in the virus complex. This may have originated from a predominance of *M. avenae* in New York and a fluctuation in the populations of the two aphids in Washington.

GAUD (S. M.). **Control of the red-banded thrips, *Selenothrips rubrocinctus* Giard, on *Acalypha*.**—*J. Agric. Univ. P.R.* **42** no. 4 pp. 258-262, 3 figs., 8 refs. Río Piedras, P.R., 1958. (With a summary in Spanish.)

Selenothrips rubrocinctus (Giard) infests numerous plants in Porto Rico and has recently proved injurious to ornamentals of the genus *Acalypha*. In a test, excellent control was given by emulsion sprays prepared by diluting concentrates containing 3 lb. DDT, 1 lb. γ BHC, 2 lb. aldrin or 1.6 lb. endrin per U.S. gal. at the rate of 1 pint concentrate per 100 gal.; 2-3 applications at fortnightly intervals are required.

SMITH (C. F.), MARTORELL (L. F.) & PÉREZ-ESCOLAR (M. E.). ***Myzus persicae* (Sulzer) in Puerto Rico.**—*J. Agric. Univ. P.R.* **42** no. 4 pp. 263-266, 1 fig., 5 refs. Río Piedras, P.R., 1958. (With a summary in Spanish.)

A list is given of 27 species of plants on which *Myzus persicae* (Sulz.) was collected in Porto Rico during a survey in 1954-55. They included peppers (*Capsicum annuum*), on which the aphid was common and which are known to harbour the virus of pepper mosaic. This virus causes an important disease of tobacco and is transmitted by *M. persicae*. The aphid also occurred on sweet potato, which may likewise serve as a source of infestation for tobacco.

GUAGLIUMI (P.). **Nota bio-ecológica sobre la langosta apureña *Rhammatocerus viatorius* (Sauss).** [Bio-ecological note on the Apure grasshopper, *R. viatorius*.]—*Agron. trop.* **9** no. 2 pp. 73–76, 1 fig. Maracay, 1959. (With a summary in English.)

The outbreak of the grasshopper, *Rhammatocerus viatorius* (Sauss.), in the savannahs of the State of Apure, Venezuela [*cf. R.A.E.*, A **47** 137; **48** 145] was found in March 1959 to have subsided, owing to flooding, fires and the activities of vertebrates, especially birds.

DA FONSECA (J. P.). ***Migdolus morretesi* Lane (Coleóptero Anoplodermidae) uma bróca eventual da cana de açúcar e do eucalipto.** [*M. morretesi*, an occasional borer of sugar-cane and *Eucalyptus*.]—*Arch. Inst. biol.* **25** (1958) pp. 29–40, 4 pls., 3 refs. São Paulo [1959]. (With a summary in English.)

Larvae of the Prionid, *Migdolus morretesi* Lane, which with the adult females are described, are recorded as damaging the underground parts of sugar-cane and *Eucalyptus* in the State of São Paulo, Brazil. They also feed on the roots of several indigenous plants, which may therefore have served as the source of the infestation.

HEINRICH (W. O.). **Experiências para combate à *Thecla basilides* (Geyer, 1837), broca do abacaxi (Lepid. Lycaenidae).** [Experiments on the control of *T. basilides*, the pineapple borer.]—*Arch. Inst. biol.* **25** (1958) pp. 109–119, 2 graphs, 8 refs. São Paulo [1959]. (With a summary in English.)

Tests carried out in São Paulo in 1946–48 showed that various sprays gave good control of *Thecla basilides* (Geyer) on pineapple, but that three were significantly better than the rest. These contained 0·1 per cent. Tobacine (a proprietary preparation containing 25 per cent. DDT, 28 per cent. methyl-naphthalenes and 12 per cent. other hydrocarbons), 0·005 per cent. parathion, and 0·01 per cent. parathion, respectively [*cf. R.A.E.*, A **44** 179].

FADIGAS jr. (M.) & GIANNOTTI (O.). **Inseticidas sistêmicos aplicados nas sementes para contrôle das pragas iniciais do algodoeiro.** [Systemic insecticides applied to the seeds for the control of early pests of cotton.]—*Biológico* **25** no. 9 pp. 183–188, 2 refs. São Paulo, 1959.

Seed and soil treatments with systemic insecticides for the control of early pests of cotton were tested in São Paulo in 1958–59. Phorate (Thimet) and Disyston [O,O-diethyl S-2-(ethylthio)ethyl phosphorodithioate] were used as powders on activated carbon and applied to the seed at 2 per cent. of its weight, and 5 per cent. phorate granules were applied to the furrows at an equivalent rate. All three treatments gave good control of thrips (*Hercothrips* and *Frankliniella* spp.) for 38 days and of *Aphis gossypii* Glov. for 66 days; Disyston was still effective against the latter after 101 days, when the infestation was at its peak. Control of *Tetranychus* (*Eotetranychus*) *telarius* (L.) and *Hemitarsonemus latus* (Banks) was in general poor. Three new proprietary materials of unstated composition were also tested and found unsatisfactory, and activated carbon alone was of no value.

BITANCOURT (A. A.). **O combate aos ácaros dos Citrus pelos ditiocarbamatos.** [The control of mites on *Citrus* by dithiocarbamates.]—*Biológico* 25 no. 11 pp. 227-232, 2 figs. São Paulo, 1959.

Certain dithiocarbamate fungicides, including ferbam, maneb and zineb, have been found to control *Phyllocoptruta oleivora* (Ashm.) on *Citrus*, but their use in São Paulo, Brazil, has been followed by spotting of the fruits, caused, most probably, by other mites that are not controlled. A similar situation is said to exist in Florida. Sulphur should therefore be included in dusts or sprays of these materials, or applied separately.

MARICONI (F. A. M.). **Dois novos insetos em laranjeira.** [Two new insects on orange.]—*Biológico* 25 no. 11 pp. 244-249, 2 figs., 8 refs. São Paulo, 1959.

Notes are given on the appearance, distribution, food-plants, habits and control of a Coreid, *Crinocerus sanctus* (F.) [cf. *R.A.E.*, A 19 402], and a Dynastid, *Cyclocephala melanocephala* (F.), observed injuring orange trees in Dourado, São Paulo, in April 1956. The first sucked the sap of the shoots and young leaves, and the second fed on the flowers, shoots and young leaves. Both were controlled by sprays of 0.015 per cent. parathion, and the second also by 0.05 per cent. diazinon, 0.1 per cent. malathion and 0.15 per cent. DDT.

MARICONI (F. A. M.) & ZAMITH (A. P. L.). **Notas sobre uma cochinilha e seu predador.** [Notes on a Coccoid and its predator.]—*Biológico* 25 no. 12 pp. 258-265, 3 figs., 7 refs. São Paulo, 1959. (With a summary in English.)

Cassia fistula growing in a botanical garden in Piracicaba, São Paulo, was found early in 1959 to be infested by *Mimosicrya hempeli* (Ckll.), which was being attacked by a Coccinellid identified as *Exoplectra erythrogaster* Muls. The appearance, distribution and habits of these two insects are described. In tests on the control of the Coccoid, malathion in oil emulsion proved ineffective against adults, and methyl-demeton applied as a systemic insecticide in the irrigation water or by trunk injection also failed. The nymphs are susceptible to insecticides commonly used against Coccids, and the best time for treatment is in September-November, when the crawlers leave the parent females.

ROSSETTI (V.), FASSA (T. G.) & MUSUMECI (R. M.). **Um novo ácaro dos laranjais paulistas.** [A new mite on orange in São Paulo.]—*Biológico* 25 no. 12 pp. 273-275, 1 fig., 16 refs. São Paulo, 1959.

Brevipalpus phoenicis (Geijskes) is recorded from sweet-orange trees suffering from 'leprosis' [cf. *R.A.E.*, A 34 298] in São Paulo, and the literature on its control is reviewed.

COSTA (A. S.), MOREIRA (S.) & MARICONI (F. A. M.). **Ocorrência do "ácaro das gemas" em plantações citrícolas de São Paulo.** [The occurrence of the bud mite in *Citrus* groves in São Paulo.]—*Biológico* 26 no. 2 pp. 21-26, 2 figs., 5 refs. São Paulo, 1960. (With a summary in English.)

Aceria sheldoni (Ewing) was observed on *Citrus* in São Paulo for the first time in August 1959. The local distribution of the mite, its economic importance and methods of control are reviewed.

DULANTO BARTRA (A.). **La importancia del "abejorro", *Melitoma euglossoides* Lep. & Serv. en la polinización de las flores del algodón Tangüis.** [The importance of *M. euglossoides* in the pollination of the flowers of Tangüis cotton.]—*Rev. peruana Ent. agric.* 1 no. 1 pp. 6-11, 4 graphs, 3 refs. Lima, 1958.

Melitoma euglossoides Lep. & Serv. is a solitary bee that pollinates the flowers of cotton in Peru, but observations in three valleys in 1955-57 failed to show that its activities had much effect in reducing shedding.

PIEDRA MAGLIOLA (V.). **El "despunte" o "topping" del algodonero como medida cultural-entomológica en el Valle del Chira.** [Topping of cotton as a cultural-entomological measure in the Chira Valley.]—*Rev. peruana Ent. agric.* 1 no. 1 pp. 11-14. Lima, 1958.

Observations in the Chira Valley, Peru, in 1953-54, indicated that the elimination of the terminal shoots of cotton plants, known as 'topping,' reduced infestation by several important insect pests, chiefly by removing them or accelerating plant maturation.

HOYLE (P. C.). **Algunas experiencias sobre *Catolaccus townsendi* Crwf. (Hymenoptera: Chalcididae).** [Investigations on *C. hunteri*.]—*Rev. peruana Ent. agric.* 1 no. 1 pp. 14-16. Lima, 1958.

Catolaccus hunteri Crwf. (*townsendi* Crwf.) was found parasitising the cotton weevil [*Anthonomus vestitus* Boh.] in the Pisco Valley, Peru, in 1957, and its bionomics were investigated in the laboratory. Development lasted 17-23 days for males and 19-28 days for females, according to season, and 20 per cent. of the pupae survived storage for a month at low temperature in a refrigerator; 70 per cent. of the adults survived for four months when provided with honey and water. Pairing occurred within a day of emergence, but oviposition in infested cotton buds not until the third day.

LÉON TANG (J.). **Notas generales sobre nemátodos portadores de bacterias como un método de control biológico.** [General notes on nematodes carrying bacteria as a means of biological control.]—*Rev. peruana Ent. agric.* 1 no. 1 pp. 19-22, 3 figs., 5 refs. Lima, 1958.

In 1954, high mortality among larvae of *Cydia (Carpocapsa) pomonella* (L.) on apple in Virginia was found to be due to an association of bacteria with a parasitic nematode [cf. *R.A.E.*, A 45 409]. The nematode, referred to as DD-136, belonged to the Steinernematidae, which are restricted to insects, and it perforated the gut of the larvae and liberated bacteria that multiplied rapidly and killed the insect host in less than 24 hours. The nematode also multiplied rapidly in the insect. The nematode was reared in *Galleria mellonella* (L.), and field tests indicated that the disease caused by it afforded 60-70 per cent. control of *C. pomonella*. Similar results were obtained on *Heliothis zea* (Boddie) on maize. The nematode is most active

at moderate temperatures (60–80°F.) and is susceptible to drought, since it moves in a fine film of water, but can survive for long periods without rain in the insect host, the soil, the bark of trees or plant parts affording a certain degree of moisture. In the infective stage, it is resistant to starvation, and it passes through high-pressure spray jets unharmed. Notes on its behaviour in the laboratory are given.

Infective material was received in Peru in 1957 and tested on several insects, notably pests of cotton. Among the latter, the nematode attacked *H. virescens* (F.), *Mescinia peruella* Schaus, *Pococera atramentalis* (Led.), *Anthonomus vestitus* Boh. and *Dysdercus peruvianus* (Guér.). In a field test in which cotton plants in cages were sprayed with suspensions of the nematode at various concentrations, some control of *D. peruvianus* was afforded, but the technique evidently required improvement.

LOBATÓN MÁRQUEZ (M.). **Algunas investigaciones sobre el parasitismo de los huevos de *Mescinia peruella* Schaus, en el Valle de Pisco.** [Some investigations on parasitism of the eggs of *M. peruella* in the Pisco Valley.]—*Rev. peruana Ent. agric.* 1 no. 1 pp. 23–24. Lima, 1958.

The eggs of *Mescinia peruella* Schaus on cotton in the Pisco Valley of Peru are parasitised by a species of *Trichogramma*, up to 50 per cent. or more of them being attacked. Notes are given on the rearing of the parasite and its possible use in biological control. It also attacks the eggs of other insects.

RISCO (S. H.). **La utilización de *Paratheresia claripalpis* W., para el control biológico de *Diatraca saccharalis* Fabr., con especial referencia a los resultados obtenidos en los Valles de Pativilca y Huaura.** [The use of *P. claripalpis* for the biological control of *D. saccharalis*, with special reference to the results obtained in the Pativilca and Huaura Valleys.]—*Rev. peruana Ent. agric.* 1 no. 1 pp. 24–29. Lima, 1958.

The following is based on the author's summary. Investigations showed that the indigenous Tachinid parasite, *Paratheresia claripalpis* (Wulp), could be used with success for the control of *Diatraca saccharalis* (F.) on sugar-cane in Peru. Liberations resulted in up to 40 per cent. reduction in the intensity of infestation. The outstanding results obtained in two valleys are cited.

LAMAS C. (J. M.). **Control del "picudo peruano" *Anthonomus vestitus* Bohm. con arseniato de plomo solo y en mezcla con melaza de caña.** [Control of the Peruvian boll-weevil, *A. vestitus*, with lead arsenate alone and in mixture with cane molasses.]—*Rev. peruana Ent. agric.* 1 no. 1 pp. 29–33, 3 figs., 3 refs. Lima, 1958.

In the Carabayllo Valley of Peru, the use of organic insecticides on cotton was suspended in the season of 1954–55, because of their harmful effect on beneficial insects and the consequent outbreaks of pests normally of only secondary importance. Insecticide treatments were restricted to sprays of lead arsenate. These gave good control of some pests and permitted natural enemies to increase and control others. Control of *Anthonomus vestitus*

Boh. was unsatisfactory, but was greatly improved in the following season by the addition of molasses or 'banana essence' as an attractant. Applications from aeroplanes gave poor results.

JOO CHANG (L.). **El recojo del arrebiatado** (*Dysdercus peruvianus* Guerin) como un método de conteo. [Collection of *D. peruvianus* as a method of counting.]—*Rev. peruana Ent. agric.* 1 no. 1 pp. 33–35, 2 figs. Lima, 1958.

A method of effecting field counts of *Dysdercus peruvianus* (Guér.) on cotton in Peru by means of teams of 5–6 boys is described.

WILLE (J. E.). **Observaciones bio-ecológicas sobre el "arrebiatado"** (*Dysdercus peruvianus* Guerin) con conclusiones prácticas agrícolas. [Bio-ecological observations on *D. peruvianus*, with practical conclusions for agriculture.]—*Rev. peruana Ent. agric.* 1 no. 1 pp. 35–37, 4 refs. Lima, 1958.

The following is based on the author's summary. The importance of *Dysdercus peruvianus* (Guér.) as a pest of cotton in Peru depends on weather. Observations in 1935–55 showed that springs in which there is little insolation and much cloud favour the occurrence of outbreaks in summer and autumn, whereas much insolation in spring kills the Pyrrhocorids.

BAGLEY (R. W.). **Algunos recientes ensayos para el control del "arrebiatado"** (*Dysdercus peruvianus* Guerin). [Some recent experiments on the control of *D. peruvianus*.]—*Rev. peruana Ent. agric.* 1 no. 1 pp. 37–38, 1 ref. Lima, 1958.

Investigations on the control of *Dysdercus peruvianus* (Guér.) on cotton in the Nepeña Valley, Peru, in 1956 indicated that BHC was the most effective of several insecticides tested and that light-traps, though useful for assessing populations, were useless for control. Notes on other methods of attack are included.

COMBE LOERO (I.). **Algunos aspectos del comportamiento de ciertos insecticidas en la campaña algodonera 1956–57 en el Valle de Pisco.** [Some aspects of the performance of certain insecticides in the cotton season of 1956–57 in the Pisco Valley.]—*Rev. peruana Ent. agric.* 1 no. 1 pp. 38–40. Lima, 1958.

Notes are given on the occurrence of insect pests of cotton in the Pisco Valley of Peru in 1956–57 and on the effectiveness of the various insecticides tested against them. Lead-arsenate sprays were much used against *Anthonomus vestitus* Boh., but gave doubtful results, and the molasses incorporated in them sometimes injured the plants and trapped predacious insects. Early sprays of lead arsenate controlled *Heliothis virescens* (F.). Among several organic insecticides also tested in sprays, DDT was not very effective against *H. virescens*, but DDD (Rothane) gave promising control of *Eulia* (*Argyrotaenia*) *sphaleropa* (Meyr.).

ALARCÓN B. (J. A.), GAMERO DE LA TORRE (M.) & ARAOZ (P.). **Control del gusano de tierra del algodonero *Feltia experta* Wlk. (Noctuidae) mediante el tratamiento del suelo y la semilla.** [Control of the cotton cutworm, *F. experta*, by soil and seed treatment.]—*Rev. peruana Ent. agric.* 1 no. 1 pp. 41-43. Lima, 1958.

Experiments in Peru in 1956-58 showed that the larvae of *Feltia experta* (Wlk.) attacking cotton were best controlled by treatment of the seed with aldrin.

GONZÁLEZ BACHINI (J. E.). **Enemigos naturales y control químico del ácaro de la "verruga" del algodonero, *Eriophyes gossypii* Banks (Acarina, Eriophyidae).** [Natural enemies and chemical control of the cotton mite, *Cecidophyes gossypii*.]—*Rev. peruana Ent. agric.* 1 no. 1 pp. 43-46, 4 refs. Lima, 1958; also as *Inf. Estac. exp. agric. La Molina* no. 108, [1+] 14 pp., 3 figs., 4 refs. Lima, 1958. (With a summary in English.)

The following is based on the author's summary. Damage to cotton by *Cecidophyes (Eriophyes) gossypii* (Banks) in the coastal valleys of Peru was severe in 1956-58, owing to the effect of BHC and parathion applied against *Dysdercus peruvianus* (Guér.) on natural enemies of the mite. Sulphur dusts and sprays gave the best control.

HERRERA ARANGÜENA (J.). **Resistencia de ciertas plagas del algodonero a los insecticidas orgánicos en el Valle de Cañete.** [The resistance of certain cotton pests to organic insecticides in the Cañete Valley.]—*Rev. peruana Ent. agric.* 1 no. 1 pp. 47-51, 4 figs., 15 refs. Lima, 1958. (With a summary in English.)

The following is based on the author's summary. Chlorinated-hydrocarbon insecticides, which had proved effective against pests of cotton in the Cañete Valley of Peru since 1947, gave less satisfactory results in 1952, when dusts of γ BHC at 0.45 lb. per acre gave only 28 per cent. control of *Aphis gossypii* Glov., whereas 0.28 lb. formerly gave up to 96.5 per cent. In 1953-54, toxaphene failed to control *Anomis texana* Ril., and DDT failed against a severe outbreak of *Heliothis virescens* (F.) in 1955-56. In laboratory cage tests, a dust of 10 per cent. DDT gave only 13 per cent. mortality of larvae of *H. virescens* from Cañete, as compared with 88 per cent. kill of larvae from another locality.

WILLE (J. E.). **La mosca mediterránea *Ceratitis capitata* Wied., en el Perú.** [The Mediterranean fruit-fly, *C. capitata*, in Peru.]—*Rev. peruana Ent. agric.* 1 no. 1 pp. 59-60. Lima, 1958.

The following is based on the author's summary. *Ceratitis capitata* (Wied.), which was formerly unknown in Peru, was found there on *Citrus* at Huánuco and other coastal localities in October-November 1956, probably as a result of spread from Brazil, which would be facilitated by the availability of wild fruits in the intervening forest. In Peru, spread appeared to be slow and the damage slight.

GAMERO DE LA TORRE (O.). **Trabajos de control de las moscas de la fruta**
Ceratitis capitata Wied. y *Anastrepha striata* Schin. (Tryptidae).
 [Work on the control of the fruit-flies *C. capitata* and *A. striata*.]—Rev. peruana Ent. agric. 1 no. 1 pp. 60–66, 10 refs. Lima, 1958.

In view of the finding of *Ceratitis capitata* (Wied.) on *Citrus* in Peru [cf. preceding abstract], all stages and the bionomics of this fruit-fly are described, work on its control elsewhere is reviewed, and plans for the combined control of *C. capitata* and *Anastrepha striata* Schin., which has caused increased damage to *Citrus* since 1952, are announced.

BOCANERA (S.) & SIMON F. (J. E.). **Resultados de un experimento comparativo de insecticidas contra los insectos del maíz para grano.**
 [Results of a comparative test of insecticides against insects in maize for grain.]—Rev. peruana Ent. agric. 1 no. 1 pp. 66–69. Lima, 1958.

Maize grown in Peru is attacked by *Diatraea saccharalis* (F.), *Spodoptera (Laphyga) frugiperda* (J.E. Smith), *Marasmia trapezalis* (Gn.), *Elasmopalpus lignosellus* (Zell.), *Aphis maidis* Fitch and *Diabrotica* sp. In tests of numerous insecticides for their control in 1954–55, sprays of 0·1 per cent. isodrin and endrin gave the best results against the first two, which were the only ones of importance, and were superior to phosphorus compounds in sprays or in soil treatments applied at sowing time.

SIMON F. (J. E.). **Algunos aspectos del control químico de los insectos de la papa en la Sierra.** [Some aspects of the chemical control of potato insects in the Sierra.]—Rev. peruana Ent. agric. 1 no. 1 pp. 70–71. Lima, 1958.

Experiments in Peru in 1956–57 showed that foliage sprays were better than soil treatments for the control of *Premnotrypes solani* Pierce and other weevils attacking potato, and that, in them, 0·5 per cent. aldrin was somewhat more effective than 0·5 per cent. DDT.

JAQUES (R. P.) & FOX (C. J. S.). **The influence of stickers on the effectiveness of sprays of *Bacillus thuringiensis* var. *thuringiensis* Berliner and *Bacillus entomocidus* var. *entomocidus* Heimpel and Angus.**—J. Insect Path. 2 no. 1 pp. 17–23, 12 refs. New York, N.Y., 1960.

The following is based on the authors' summary. Field tests in Nova Scotia in 1959 showed that the addition of skim-milk powder or Geon latex 652 (a vinyl latex) as an adhesive enhanced the effectiveness of commercially produced spore preparations of *Bacillus thuringiensis* var. *thuringiensis* and *B. entomocidus* var. *entomocidus* in sprays for the control of *Pieris rapae* (L.) on cabbage. Control of *Operophtera brumata* (L.) and *Alsophila pometaria* (Harris) on apple by *B. thuringiensis* was not increased by them. A heavy infestation of *Heliothis zea* (Boddie) on sweet maize was not affected by *B. thuringiensis*.

DOANE (C. C.). **Bacterial pathogens of *Scolytus multistriatus* Marsham as related to crowding.**—J. Insect Path. 2 no. 1 pp. 24–29, 1 graph, 7 refs. New York, N.Y., 1960.

The following is based on the author's summary. *Aerobacter scolyti* and *Escherichia klebsiellaeformis*, obtained from France [cf. R.A.E., A 44 256],

were compared with *Serratia marcescens* [cf. 48 359] for pathogenicity to the last-instar larvae of *Scolytus multistriatus* (Marsham) confined with contaminated ground bark. It was found that the larvae bite one another on contact, and that the three bacteria may infect them through these injuries. Crowding the larvae increased the number of bites and hence the efficacy of the bacteria as pathogens. Uninjured larvae seldom became infected. Mortality was similar for the three bacteria studied.

OSSOWSKI (L. L. J.). **Variation in virulence of a wattle bagworm virus.**—*J. Insect Path.* 2 no. 1 pp. 35-43, 12 refs. New York, N.Y., 1960.

The following is based on the author's summary. To obtain further information on the occurrence and virulence of strains of the nuclear polyhedrosis virus of *Kotochalia junodi* (Heyl.) on wattle [*Acacia mollissima*] in South Africa [cf. R.A.E., A 45 385; 47 453], small-scale field experiments were conducted with sprays of virus suspensions from different sources. A suspension of the nuclear polyhedrosis virus of *Heliothis armigera* (Hb.) was also used. With a light infestation of *K. junodi* in its first year of outbreak and the larvae newly hatched or in the second or third instar at the time of treatment, *Kotochalia* viruses from plantations distant 160-200 miles from the experimental area caused significantly higher mortality throughout than did any others. Viruses from plantations 20-40 miles away gave a greater initial kill than did local virus or that from the thornveldt, and the *Heliothis* virus, though giving a higher mortality than occurred in untreated plots up to three months after spraying, was less effective than any *Kotochalia* virus. With a heavy infestation in its second year and the larvae in the first instar, mortality was significantly higher with virus from the greatest distances than with any other *Kotochalia* virus, but only initially. Later, there was no significant difference between *Kotochalia* viruses, but all were more effective than the *Heliothis* virus. These results suggest that different strains of the *Kotochalia* virus exist, and that a given population of the Psychid differs in its susceptibility to them.

STEINHAUS (E. A.) & DINEEN (J. P.). **Observations on the role of stress in a granulosis of the variegated cutworm.**—*J. Insect Path.* 2 no. 1 pp. 55-65, 18 refs. New York, N.Y., 1960.

The following is virtually the authors' summary. An attempt was made to gain some indication as to the rôle of five different 'stressors' in a granulosis of *Peridroma saucia* Hb. (*margaritosa* (Haw.)). In general it was found that, with the possible exception of ether, none of these test factors (excessive heat, excessive cold, ultraviolet light, abnormal nutrition) significantly enhanced, promoted or induced granulosis infection in *Peridroma* larvae. Considerable mortality in the test insects resulted from the action of the test factors themselves, and from other non-virus causes, such as bacterial infection.

SIMONS (J. N.). **Variation in efficiency of aphid transmission of southern cucumber mosaic virus and potato virus Y in pepper.**—*Virology* 9 no. 4 pp. 612-623, 9 refs. New York, N.Y., 1959.

The main results of the experiments described, in which clones of *Aphis gossypii* Glov. and *Myzus persicae* (Sulz.) were used to transmit two viruses from infected to healthy pepper plants (*Capsicum annuum*), have already been noticed [R.A.E., A 47 484].

ORLOB (G. B.) & ARNY (D. C.). **Transmission of barley yellow dwarf virus by different forms of the apple grain aphid, *Rhopalosiphum fitchii* (Sand.).**—*Virology* 10 no. 2 pp. 273-274, 2 refs. New York, N.Y., 1960.

The winter forms of *Rhopalosiphum fitchii* (Sand.) occur on apple and hawthorn (*Crataegus*), which, unlike the graminaceous food-plants of the summer forms, are not susceptible to infection with the virus of barley yellow dwarf. In experiments in Wisconsin in which gynoparae, oviparae and males collected from hawthorn in the autumn of 1958 were transferred to infected barley, all showed some ability to adapt themselves to the plants, but only the oviparae transmitted the virus when the aphids were transferred to healthy barley 4-5 days later. In similar tests in spring, the fundatrices did not feed on barley and soon died, but alate fundatrigeniae fed in the later nymphal stages and transmitted the virus. Alate fundatrigeniae from apple fed, but failed to transmit.

KRYWIENCYK (J.) & BERGOLD (G. H.). **Serological relationships of viruses from some Lepidopterous and Hymenopterous insects.**—*Virology* 10 no. 3 pp. 308-315, 16 refs. New York, N.Y., 1960.

The following is virtually the authors' summary. The serological relationships of 17 different insect viruses from four continents were investigated by the complement-fixation technique [*cf. R.A.E.*, A 47 44]. Three distinct groups were found: nuclear polyhedral viruses of Lepidoptera, nuclear polyhedral viruses of Hymenoptera, and capsule viruses of Lepidoptera. Most members within each group could also be distinguished serologically. The results are in agreement with previous morphological and chemical investigations as well as serological investigations of the corresponding inclusion body proteins, which all show similar relationships. Thus, the classification of certain insect viruses into genera and species appears to be justified.

SINHA (R. C.). **Comparison of the ability of nymph and adult *Delphacodes pellucida* Fabricius, to transmit European wheat striate mosaic virus.**—*Virology* 10 no. 3 pp. 344-352, 1 fig., 11 refs. New York, N.Y., 1960.

The following is based on the author's summary of this account of investigations at Rothamsted. The ability of *Callipypona* (*Delphacodes*) *pellucida* (F.) to transmit the virus of European wheat striate mosaic to its progeny and to wheat [*cf. R.A.E.*, A 49 49] depends on the age at which the insects acquire virus from diseased plants, and is greater with nymphs than with adults. Infective progeny and eggs that died [*cf. loc. cit.*] were produced only by infective females that had fed on diseased plants as nymphs. There may be a critical time comparatively early in the development of the ovaries before which the virus must be established in them to be transmitted to the progeny.

Adults were rendered infective by puncturing the anterior of the abdomen with a fine needle immediately before or after feeding on diseased plants [*cf. 21* 486]. Puncturing the abdomen a week after acquisition of the virus or puncturing the thorax at any time did not make them infective. Evidently the virus must pass through the gut wall for the insect to become infective, and the permeability of the gut wall to the virus presumably decreases with increasing age of the insect.

LITTAU (V. C.) & MARAMOROSCH (K.). **A study of the cytological effects of aster yellows virus on its insect vector.**—*Virology* 10 no. 4 pp. 483-500, 8 figs., 35 refs. New York, N.Y., 1960.

The following is virtually the authors' summary. Cytological examination of viruliferous adults of *Macrosteles fascifrons* (Stål) that had fed for at least three weeks on plants infected with the eastern strain of the aster yellows virus showed that the characteristic microscopic morphology of the fat-body had undergone certain changes. In extreme cases the nuclei had changed from round or irregular to sharply stellate in shape, while the cytoplasm became less homogeneous. The fat-body in the extreme viruliferous type was shown to have suffered an actual loss of tissue, although this very likely resulted from its having become more soluble (as a consequence of the presence of virus) in the preparative reagents used. The cytological changes were most clearly demonstrated in males, although females showed some slight effects. No virus-caused cytological effects were detected in *M. fascifrons* with a second strain of the aster yellows virus, in other Cicadellids with the eastern strain, or with the maize stunt virus and its vector, *Dalbulus maidis* (De Long & Wole).

Cytochemical tests for glycogen, protein and lipid, which were used in order fully to describe the fat-body cells, showed no further difference between viruliferous and virus-free insects.

SIDOR (C.). **A polyhedral virus disease of *Chrysopa perla* L.**—*Virology* 10 no. 4 pp. 551-552. New York, N.Y., 1960.

Larvae of *Chrysopa perla* (L.) feeding in the laboratory on larvae of *Lymantria (Porthetria) dispar* (L.) that had died from a polyhedrosis virus disease themselves became infected with a polyhedrosis, and the latter was communicable from one *Chrysopa* larva to another.

MACKINNON (J. P.). **Combined transmission by single aphids of two viruses that persist in the vector.**—*Virology* 11 no. 2 pp. 425-433, 1 fig., 9 refs. New York, N.Y., 1960.

The following is virtually the author's summary. When single apterae of *Myzus persicae* (Sulz.) were reared on plants infected with potato leaf-roll virus, those that acquired the virus subsequently acquired and transmitted the unrelated turnip-latent virus as readily as did other aphids reared on healthy plants. Similarly, aphids reared on plants infected with turnip-latent virus subsequently acquired and transmitted potato leaf-roll virus as readily as virus-free aphids. Furthermore, when aphids fed on a plant infected with both viruses, each aphid apparently acquired and transmitted either virus independently of the other. It seems, therefore, that the presence of one of these two viruses within *M. persicae* does not adversely affect its ability to acquire and transmit the other.

BIERER (B. W.) & VICKERS (C. L.). **The effect on egg size and production, of fungicide-treated and fumigated grains fed to hens.**—*J. Amer. vet. med. Ass.* 134 no. 10 pp. 452-453, 2 refs. Chicago, Ill., 1959.

The experiments described were carried out in view of reports that grain, notably oats, fumigated with ethylene dibromide, reduces the size or number

of eggs laid by hens feeding on it [cf. *R.A.E.*, A 44 36], and the following is taken from the authors' summary of the results. Oats fumigated several months previously with ethylene dibromide reduced the size but not the number of eggs laid during a 23-day feeding period. Feeding for ten days on oats treated with ten times the recommended dose resulted in a marked decline in egg size and number, and most of the eggs laid for two weeks after the birds had been returned to a normal ration were small or very small. The birds still laid fewer and smaller eggs than normal after six weeks on normal ration.

MAELZER (D. A.). **The behaviour of the adult of *Aphodius tasmaniae* Hope (Col., Scarabaeidae) in South Australia.**—*Bull. ent. Res.* 51 pt. 4 pp. 643-670, 1 pl., 8 figs., 11 refs. London, 1961.

The following is virtually the author's summary of this account of observations in 1954-56. In the lower south-east of South Australia, adults of *Aphodius tasmaniae* Hope [cf. *R.A.E.*, A 48 146], a pest of improved pastures [cf. 48 376], emerge from the soil 2-3 days after rain has fallen in summer. The females may lay two batches of eggs. The first (about 35 eggs) is developed at the expense of the fat-body and is laid 3-6 days after emergence; a second (about 20 eggs) can be developed and laid after the female has fed on dung. The beetles are crepuscular and fly after sunset if the weather is suitable. The first batch of eggs may or may not be laid before flight, depending on the weather. Until the fat-body is largely depleted, beetles fly with the wind and are attracted to lights, but after that stage they fly upwind to dung and are not attracted to lights. After feeding on dung for a few days the females become gravid again, and apparently change their responses to light and wind once more.

The distribution of larvae in the field suggested that adults aggregate and lay eggs in specific places. The factors that promote aggregation were therefore studied. The survival-rate of the females and the number of eggs laid in two soils, a sand and a clay loam, were related to the 'available water' in soil as measured by the pF scale. Females survived in largest numbers and laid most eggs in the range of pF 2.8-3.2 in both soils. Similarly, when given a choice of water contents in soil, beetles aggregated in largest numbers within the range 2.8-3.2 in the clay loam and 2.8-3.5 in the sand. In the latter soil, however, the pF values tested were more widely spaced, and it is suggested that the combined data are intelligible only if there was an optimum range of pF within the vicinity of 2.8-3.2 in both soils. These and other experiments indicated that moisture in soil was the major factor capable of promoting aggregations of adults. When water was not limiting, aggregations of beetles occurred on loose as opposed to compact surfaces. However, 'shelter' (dry grass stems broken off the parent plant, dung, etc.) was capable of promoting aggregations even if the soil underneath ordinarily inhibited burrowing. Aggregations of beetles also occurred on surfaces into which other beetles had previously burrowed; this was probably due not to any attraction of beetles to other beetles, but to loosening of the surface soil by the original beetles, which permitted later arrivals to burrow rapidly.

It is probable that the patchy distribution of larvae in the field is due to the aggregation of the adults, mainly in relation to moisture in soil, type of surface and shelter. It is also suggested that aggregations of larvae that occur round conspicuous objects, such as trees, result from beetles colliding with these while flying after dark, dropping to the ground and burrowing into it to lay eggs.

WILLIAMS (D. J.). Notes on the genus *Heterococcus* Ferris (Coccoidea, Homoptera) with a description of a new species injurious to guineacorn (*Sorghum vulgare*) in Nigeria.—*Bull. ent. Res.* 51 pt. 4 pp. 671-675, 2 figs., 7 refs. London, 1961.

Heterococcus nigeriensis, sp. n., is described from adults taken on sorghum (guineacorn) in Northern Nigeria [cf. next abstract] in 1958-59. This mealybug, which causes severe distortion, occurs between the stem and leaf sheath or in the rolls of deformed leaves. A morphologically similar form that feeds on the expanded leaves and does not cause distortion possibly represents a biological race of it. Characters are given for the separation of *H. nigeriensis* from *H. (Ripersia) pulverarius* (Newst.), which was originally described from *Agrostis tenuis (vulgaris)* in England and is here redescribed. It is the only British species of the genus, *H. (Phenacoccus) nudus* (Green) [R.A.E., A 14 595] being a synonym of it.

HARRIS (E.). Distortion of guineacorn (*Sorghum vulgare*) caused by a mealybug, *Heterococcus nigeriensis* Williams, in Northern Nigeria.—*Bull. ent. Res.* 51 pt. 4 pp. 677-684, 1 pl., 2 figs., 1 ref. London, 1961.

The following is virtually the author's summary. Distortion, a severe stunting and deformation of sorghum (guineacorn) in Northern Nigeria, has been shown to be caused by *Heterococcus nigeriensis* Williams [cf. preceding abstract]. The symptoms are striking; affected stems are much shorter and wider than normal and leaves are mis-shapen, with irregularly divergent veins and white tissue between them. Symptoms in the field vary from small patches of distortion on otherwise normal plants to whole plants affected. The abnormal leaves of a plant with severe distortion are crumpled and remain rolled together. Growth of the plants virtually ceases if the infestation continues, but, in the absence of the mealybug, affected plants recover and produce normal leaves.

Distortion is common in the field on sorghum, maize and *Cynodon dactylon*, and was found once only on *Pennisetum typhoides* (bulrush millet) and *Chloris pycnothrix*; it was produced experimentally on maize, rice, wheat, *P. typhoides*, *C. dactylon* and *Digitaria exilis* by transferring mealybugs from affected sorghum. The mealybugs causing distortion are yellowish pink. They are found in small numbers in protected positions on affected plants and feed on meristematic tissues. A few colonies of grey mealybugs, which cannot be distinguished morphologically from the pink form, were found on expanded leaves of healthy tillers; they apparently prefer to feed on mature tissues and do not normally cause distortion.

Distortion was investigated by feeding single mealybugs (after 48 hours' starvation) for limited periods on sorghum seedlings growing on cotton-wool in test-tubes. Of 123 seedlings, 36 developed symptoms of distortion after presumed feeding times of up to 51 hours; the shortest presumed feeding time to give rise to distortion was seven hours. Symptoms developed rapidly, starting within 24 hours of the commencement of feeding. After removal of the mealybugs, affected seedlings all recovered and produced healthy leaves within 11 days. By feeding mealybugs on seedlings before the first leaf broke out of the coleoptile, it was shown that the insects insert the stylets through one or more leaves to feed on the inner ones, so that a single mealybug affects several leaves at one time and the symptoms have the appearance of being systemic. Distortion is unlike a toxic feeding effect because it involves no wilting or death of the cells and severe symptoms can be caused by a single mealybug feeding for a short time. It resembles a

simple gall the growth of which is initiated by feeding. The main carry-over of mealybugs in the dry season seems to be on tillers from sorghum stubble, and it is suggested that crop sanitation and improved cultural methods should give adequate control.

BURGES (H. D.). The effect of temperature, humidity and quantity of food on the development and diapause of *Trogoderma parabile* Beal.—*Bull. ent. Res.* **51** pt. 4 pp. 685–696, 2 figs., 18 refs. London, 1961.

The following is substantially the author's summary. The rate of development and the egg-production of the Dermestid, *Trogoderma parabile* Beal, at 30°C. [86°F.] and 60–70 per cent. relative humidity and the effect on larval development of volume of food, temperature and relative humidity were determined, the stock used being bred from the holotype and an allotype and obtained from Arizona. In 15–450 cc. wheatfeed at 30°C. and 60–70 per cent. relative humidity, active adults were obtained from eggs in a mean of 39 days (the egg, larval, pupal and pre-emergence periods lasting 6, 26, 5 and 2 days, respectively). Males developed slightly more rapidly than females. On an average, a female adult lived for eight days and 53 of her offspring reached maturity. The weekly rate of increase of a population of stable age distribution (λ) was $\times 1.7$. At temperatures between 17.5 and 37.5°C. [63.5 and 99.5°F.] and 70 per cent. relative humidity and at relative humidities between nearly 0 and 90 per cent. and 30°C., the larvae grew to a large size, but in 0.7–25 cc. food some of these large larvae entered a facultative diapause, as a result of restricted space. Disturbance of the food increased the proportion of diapause larvae. The diapause larvae fed and moulted intermittently. At 30°C. and 60–70 per cent. relative humidity, a period of seven weeks after hatching was adopted arbitrarily to distinguish diapause and non-diapause larvae. Only a limited success was attained in breaking the diapause, which is less readily broken than that of *T. granarium* Everts [cf. *R.A.E.*, A **47** 375]. Without diapause, the two species breed at similar rates. They have similar, wide ranges of humidity and food material. The temperature range of *T. parabile* is probably a little below that of *T. granarium*, but equally wide. It is considered that *T. parabile* may become an important pest [cf. **46** 384; **49** 22], though a less serious one than *T. granarium*.

WHEATLEY (P. E.). Rearing *Pseudotheraptus wayi* Brown (Coreidae), a pest of coconuts in East Africa, and evaluation of its susceptibility to various insecticides.—*Bull. ent. Res.* **51** pt. 4 pp. 723–729, 8 refs. London, 1961.

The following is based largely on the author's summary. A method is described for the large-scale rearing of *Pseudotheraptus wayi* Brown, the Coreid causing immature nutfall of coconuts in East Africa [cf. *R.A.E.*, A **43** 170]. Adults were kept in cages with sides of thick white drill and wire gauze, in an outdoor insectary near Mombasa, Kenya, and were provided with freshly collected fallen nutlets from which the bracts had been removed. Eggs were normally laid on the walls of the cage. The nutlets were replaced every two days, and all newly hatched nymphs were removed, placed in other cages and supplied with fresh nutlets every second day. There was some mortality of first- and second-instar nymphs due to handling when nutlets were replaced, but mortality in the later nymphal stages was

very low. Under these conditions, the life-cycle from egg to adult was completed in 35-40 days.

The toxicities to *Pseudotheraptus* adults of dieldrin, DDT, γ BHC, malathion and pyrethrins in a solvent were compared by topical application of measured-drop doses from an Agla micrometer syringe in a range of five concentrations (except for DDT, for which eight concentrations were used), and the mortality counts at 72 hours were taken as the measure of toxicity. Probit analysis indicated that dieldrin was markedly more toxic than DDT, and that the toxicity of pyrethrins to this insect was of a very low order; γ BHC was rather more and malathion somewhat less toxic than dieldrin. In a supplementary experiment to determine whether the addition of resin improved the toxicity of DDT when applied topically [cf. 47 170], batches of adults were treated with measured drops of a solution of p,p'DDT (0.5 per cent. for females, 0.25 per cent. for males) and others with the same concentrations of DDT to which coumarone indene resin at one-tenth of the DDT content had been added. The toxicity of the DDT was not enhanced.

It is concluded from consideration of effectiveness and costs that dieldrin would be the most suitable residual insecticide for field trial against *Pseudotheraptus*, and that, for trials as aerosols, dieldrin, γ BHC and malathion are likely, price for price, to give results of the same order and to be superior to DDT.

NORRIS (M. J.) (Mrs. O. W. RICHARDS). **Group effects on feeding in adult males of the desert locust, *Schistocerca gregaria* (Forsk.), in relation to sexual maturation.**—*Bull. ent. Res.* **51** pt. 4 pp. 731-753, 3 graphs, 8 refs. London, 1961.

The following is virtually the author's summary. It was previously shown that the sexual maturation of males of *Schistocerca gregaria* (Forsk.) is accelerated by crowding with other individuals of similar or greater age, and that the maturation of males kept in single pairs with older mature males is accelerated as compared with that of isolated males or males kept in single pairs with other young males or females of their own age [cf. R.A.E., A 44 151]. The effects of these groupings on the levels of feeding and excretion were investigated in the present work.

Crowded males ate and excreted more than isolated ones during the first ten days of adult life. Five males in a 9-litre cage were sufficient to induce almost the full effect, and marked effects were shown when only two were present. After 2-3 weeks, the level of feeding declined. This occurred earlier in early-maturing individuals, so that for a short period the crowded males ate little more or even less than the isolated ones. When the isolated males in their turn became mature, their feeding again fell slightly below that of the crowded ones. When all males were isolated, there was a significant tendency for those that ate least from the beginning of adult life and increased their weight least to become mature earliest. The proportion of the food utilised was not affected by density. It was higher during the early period of maximum consumption than it was after the level of feeding declined. The size of the faecal pellets declined with the level of feeding, but was not otherwise affected by density. The faecal pellets of the crowded males and of males kept in pairs had a higher water content than those of isolated ones. This was not entirely due to more rapid passage of food through the alimentary canal. Water content declined with the level of feeding, whether the decline in feeding was the diurnal one due to the drying out of the grass or the permanent one that occurred as the locusts grew older.

Young males kept in pairs with mature males ate and excreted less during the first ten days of adult life than those isolated or kept in pairs with other young males. They increased in weight less rapidly, became mature at a lower weight and remained permanently lighter than the others. Their faecal pellets were smaller and had a lower water content than those of the pairs of young males. The level of excretion (and, by inference, of feeding) in older mature males was slightly increased by crowding. In older isolated males showing delayed maturation, excretion (and, by inference, feeding) was usually reduced to a very low level. When maturation was stimulated by the introduction of a mature male, no consistent effects on feeding were demonstrated. Maturation sometimes occurred during a period of rising consumption and sometimes during one of falling consumption.

Males that had become mature early and others that had matured late were simultaneously observed at the same densities. The early-maturing males, although lighter in weight relative to their emergence weight, excreted (and, by inference, ate) more than the late-maturing ones and contained a higher percentage of water.

The results in general point to an association between a low level of feeding and rapid maturation, and it is concluded that the earlier maturation of crowded males must either be independent of the level of feeding or be due to their extra consumption being insufficient to compensate for greater metabolic requirements.

DUTT (N.). **Studies on the bionomics of the jute stem girdler, *Nupserha bicolor postbrunnea* Dutt (Col., Lamiidae).**—*Bull. ent. Res.* **51** pt. 4 pp. 765–779, 6 graphs, 14 refs. London, 1961.

The following is almost entirely the author's summary. *Nupserha bicolor postbrunnea* Dutt has recently become established throughout India on *olitorius* jute (*Corchorus olitorius*) [cf. *R.A.E.*, A **44** 428; **45** 62], possibly as a result of spread from its wild food-plant, *Sesbania aegyptiaca*, and from *C. olitorius* it has spread to other agricultural crops. Incidence on the green-manure crop, *S. bispinosa*, has increased so much in recent years that it has surpassed that on *C. olitorius*. The stem diameter most favourable for girdling and oviposition in *S. bispinosa* ranges from 3.1 to 5 mm., whilst in *C. olitorius* it is from 2.6 to 3 mm. In spite of this wide difference in preferred stem diameter, the ratio of mandibular length to depth of extra-medullary tissue of such stems in the two plants agrees well.

All the varieties of *capsularis* jute (*C. capsularis*) are unacceptable to the adults, though they are acceptable to the larvae. Adults obtained from larvae reared on varieties of *C. capsularis* also show aversion to *capsularis* types. The pest selects the susceptible *olitorius* from amongst *capsularis* jute when these are grown as a mixed crop. Among five *olitorius* varieties tested, C.G. was the most susceptible. Plants coming within the height range of 100–200 cm. are attacked more than others. Girdling causes suspension of unidirectional vertical growth, and this is followed by the appearance of a number of side branches, which are of little value for fibre.

Continued exposure of diapause larvae to soil containing up to 3 per cent. moisture inhibited termination of diapause. In soils with moisture contents between about 5 and 18 per cent., diapause development proceeded, and pupation and emergence of adults began after about 3–4 months. Under natural conditions, diapause larvae exposed on the soil surface have much less chance of survival than those placed deeper in the soil. It appears that girdling is done to arrest the flow of sap, and thus to afford suitable conditions for the development of the egg.

DOBSON (R. M.) & MORRIS (M. G.). **Observations on emergence and life-span of wheat bulb fly, *Leptohylemyia coarctata* (Fall.), under field-cage conditions.**—*Bull. ent. Res.* **51** pt. 4 pp. 803-821, 6 graphs, 4 refs. London, 1961.

The following is almost entirely the authors' summary. The emergence and life-span of adults of *Hylemyia* (*Leptohylemyia*) *coarctata* (Fall.) were studied by means of field cages [cf. *R.A.E.*, A **46** 169] at Rothamsted in 1957-58. Emergence was investigated by observing the numbers of flies emerging daily from an area of infested wheat enclosed by a cage of fine mosquito-netting, and life-span by making a daily census of marked and individually recognisable flies that had been liberated in the cage. Flies were handled only when being marked, and all observations in the later part of the work were made without touching either them or the wheat. Flies were chilled to render them comatose for marking, for which nitrocellulose lacquers were used [cf. *loc. cit.*], and under certain circumstances this and the marking proved harmful to them. Attempts were made to reduce these harmful effects.

Emergence dates varied from year to year depending on the temperatures of spring and early summer, and there were also considerable differences between the emergence dates of populations of adjacent fields in the same year. Males consistently appeared before females. The ratio of the number of flies seen to the number known to be alive on each day varied according to weather, flies being more difficult to find on windy days than on calm ones and on bright days than on dull ones. The observed life-spans of both sexes varied greatly, up to a maximum of 75 days for females and 55 days for males. An exact statement of mean life-span was not possible because there was a tendency for flies emerging later in the season to be less long-lived than those emerging earlier. Most flies of both sexes lived for over 30 days. The observed life-spans fall short of the true life-spans by amounts that depend on the proportions of living flies seen each day. Two methods are shown by which the mean unrecorded life-span can be calculated.

Proceedings of the International Conference for the Study of the Colorado Beetle and the Development of Control Measures against it. [In Russian.]— $10\frac{1}{2} \times 6\frac{3}{4}$ in., 329 pp., text illus., refs. Moscow, Mezhd. Metod. Kom. Koloradsk. Zhuku, Akad. Nauk SSSR, 1959. Price 19 rub.

This conference on *Leptinotarsa decemlineata* (Say), which was held in November 1956, was attended by representatives of 52 scientific organisations in Czechoslovakia, East Germany, Hungary, Poland and the Soviet Union, and the text of 31 papers presented at it and summaries of four more are here published, together with the introductory address by E. N. PAVLOVSKII and the final resolutions. All are in Russian, but German summaries of most of them are given at the end of the volume. Abstracts of the papers appear below.

GILYAROV (M. S.). **The problem of the Colorado beetle, the work of the Interdepartmental Commission on Methodology and the tasks awaiting the conference** (pp. 5-12, Germany summary pp. 286-287). This is a review of the work carried out in 1952-56 by a commission set up in the Soviet Union in view of the threat to potato cultivation resulting from the rapid eastward spread of *L. decemlineata* through Europe [cf. *R.A.E.*, A **48** 400, etc.]. Co-operation between members of scientific bodies was organised, plans for research were drawn up, conferences were held, the world literature on the beetle was reviewed and the principal works translated, communication with foreign states was established, and plans for quarantine and control

campaigns were prepared. The study of ways in which international co-operation in this field might be extended and strengthened and the exchange of pertinent information were the main objects of the conference.

BUHR (H.). **The bionomics and ecology of the Colorado beetle** (pp. 13-35, 11 figs., German summary p. 288). The author discusses the spread of *L. decemlineata* through France and Germany, with particular reference to eastern Germany, illustrates it on maps from records kept at Mühlhausen, and describes observations carried out there on the bionomics and ecology of the beetle. Newly emerged adults migrated in all directions and were not attracted to potato plants from distances greater than a few centimetres. The emergence of overwintered beetles from the soil was protracted, beginning in mid-May, reaching a peak at the end of that month, and continuing until mid-June, but in some circumstances beetles were still in the soil in August. Food-plant investigations are described, with special reference to the suitability or otherwise of various wild and cultivated solanaceous plants and the susceptibility of potato varieties.

LARCHENKO (K. I.). **Peculiarities of the development and reproduction of the Colorado beetle and their relation to food conditions** (pp. 36-42, German summary pp. 289-290). The following is based on the author's summary. Investigations on various species of insects have shown that food conditions are responsible for irreversible changes in internal structure. The degree of development of the fat-body provides an index of such conditions and of the physiological state of the insect in all stages of development and is related to life-span, fecundity and resistance to unfavourable environmental factors. Investigations on the rôle of the fat-body in the development and activity of insects facilitate an understanding of ecological requirements, the causes of outbreaks, migration and varying levels of vitality.

Investigations on the effect of food on the physiological condition of *L. decemlineata* have not been reported in the literature, but it can be assumed that winter survival and population increase depend mainly on nutritional conditions. Work in the Soviet Union and Poland has shown that the physiological condition of the beetle during its active life and at the onset of the diapause depends on the physiological and biochemical condition of the food-plants, in particular, on the lipoid-protein relation in the leaves. The richer these are in lipoids and the poorer in protein, the more rapid and the more successful is the transition to diapause, though this is also affected by fat-accumulation and day-length. Nutrition affects the state of the fat-body in larvae, pupae and adults, and in the adults the state of the fat-body is related to maturation, the onset and duration of diapause, winter survival, resistance to poisons, diseases and other unfavourable influences, fecundity and the changes in vitality that accompany increases and decreases in population.

WĘGOREK (W.). **The results of investigations on the Colorado beetle in Poland** (pp. 43-54, 3 figs., German summary pp. 291-292). Investigations in Poland have shown that the most favourable conditions for the development of *L. decemlineata* occur in the central part of the country [cf. 46 326]. The difference between the dates of appearance of the various stages in the different regions ranges up to 14 days and was particularly great in 1956. Calculation of effective temperatures permits a forecast of the development of the beetle, and winter survival is forecast on the basis of biochemical studies, though it is affected by soil and moisture. In spring, most of the overwintered beetles are to be found on the edges of potato fields nearest to potato fields of the previous year, and the search for food-plants is not a random one. Physiological studies indicated that the beetle is little affected by the relative content of protein in the leaves, but more by their

general nutritional quality. Resistance to insecticides increases with the content of fat in the body, and sublethal doses increase activity temporarily but lead to premature exhaustion. BHC has an unfavourable effect on young plants, and DDT is best used in aerosol form. Dusts of fungus spores are effective [46 328], as are trap strips of early potatoes planted along the edges of old potato fields. Investigations on the reaction of potato varieties to damage showed that some regenerate more rapidly after infestation, and thus crop loss is reduced.

FEDOTOV (D. M.). **Report on investigations on the Colorado beetle at the Laboratory of Invertebrate Morphology of the A.N. Severtsov Institute of Animal Morphology of the Soviet Academy of Sciences (Moscow)** (pp. 55–56, German summary p. 293). The investigations here briefly reviewed were concerned mainly with factors responsible for the physiological plasticity and fecundity of *L. decemlineata* and its reactions to insecticides. Ecological, morphological and physiological methods were used.

USHATINSKAYA (R. S.). **Some physiological and biochemical peculiarities of the diapause and winter dormancy of the Colorado potato beetle (Summary)** (pp. 57–58). Investigations in the Soviet Union showed that the diapause in *L. decemlineata* is preceded by a period of active feeding during which carbohydrates and fats are accumulated and the water content falls. During the 2–3 days before the beetles become negatively phototropic and enter the soil, they cease feeding, the gut is emptied of food remains, the water content is still further reduced and resistance to unfavourable, abiotic factors, including insecticides, increases. During the diapause, gaseous exchange and the activity of tissue enzymes are much reduced. Metabolism reaches its lowest level 15–25 days after entry into the soil and then increases to a level that is maintained until spring. After overwintering, full activity is resumed over a period that lasts 2–3 weeks. Differences were noted in the physiological condition of beetles overwintering for the first and second time.

SHAROV (A. G.). **Some data on the embryonal development of the Colorado beetle** (pp. 59–63, 2 figs., 4 refs., German summary p. 294). The development of the eggs of *L. decemlineata* is discussed, and it is stated that they are the most susceptible to insecticides in the early stages.

UZHDAVINI (E. R.). **The problem of the use of inherited food reactions of insects in the evaluation of the resistance of plants to them** (pp. 64–71, 4 figs., 7 refs., German summary p. 295). Laboratory tests with larvae of *Melasma populi* (L.) showed that newly hatched individuals that had not fed remained on the leaves of plants that were unsuitable as food, but not on paper, etc. The unsuitable plants appeared to have an odour that attracted the larvae, but a less powerful one than that of their normal food-plants (poplar and ash). Differentiation of suitable and unsuitable plants appears to depend on taste. Similar tests may be of value in determining the resistance of potato varieties to *L. decemlineata*.

SCHWARTZ (E.). **Critical review of the problem of chemical control of the Colorado beetle** (pp. 72–86, 3 graphs, 17 refs., German summary pp. 296–297). This is a review of work in different countries, particularly Germany, on the effective uses of insecticides against various stages of *L. decemlineata*, including the overwintering adults, which are not easily attacked.

CHIGAREV (G. A.). **Some problems in the chemical control of the Colorado beetle** (pp. 87–89, German summary p. 298). Although many insecticides are known to be effective against *L. decemlineata*, so that control is readily achieved, many problems related to their use remain to be solved. These include the duration of effect of the insecticides, their specificity of action, the suitability of systemic insecticides, the combination of insecticides with

fertilisers, and undesirable effects on tuber flavour and quality. Further information on the behaviour of the beetle is also required.

GAR (K. A.). The study of preparations of BHC rich in γ isomer and of chlordane for soil treatments (pp. 90–101, German summary pp. 299–300). Complete eradication of *L. decemlineata* requires treatment against the beetles hibernating in the soil. BHC and chlordane have been shown to be effective for this purpose, but soil treatment with large quantities of BHC impairs the flavour of potato tubers. Tests in the Soviet Union have shown that soil insecticides have an effect on tuber yield and flavour and that preparations of γ BHC were the most effective against *L. decemlineata*. Chlordane had no tainting effect, even in loam soils, and BHC containing 75 per cent. γ isomer had very little. Both materials usually had a favourable effect on the growth of wheat and grasses.

SKUHRAVY (W.). The effect of insecticides on the seasonal dynamics of the insect fauna of potato fields (pp. 102–106, 8 graphs, German summary p. 301). DDT aerosols have a toxic, but usually only temporary, effect on the insect fauna of potato fields. Least damage to beneficial species is caused by treatment in late June or the first half of July.

KEISERUKHISKII (M. G.). Study of the optimal dates and means for treating potatoes against the Colorado beetle with preparations of DDT, BHC and calcium arsenate (pp. 107–116, 1 graph, 13 refs., German summary p. 302). Experiments in the Soviet Union have shown that DDT, BHC and calcium arsenate are not equally effective against the various stages of *L. decemlineata*. All these are highly effective against the overwintered beetles and larvae in the first three instars, but less so against later stages. Young adults that have completed 5–10 days of maturation feeding are highly resistant. BHC is the most toxic of the three, but DDT is very effective under field conditions as it remains toxic for 3–4 weeks, and suspensions are better than dusts or emulsified solutions. Treatment is best applied when the larvae reach the third or fourth instar.

RUSIN (N. M.), ANDRONOVA (G. P.), SAPRONOVA (I. N.) & VASIL'eva (O. I.). Hygienic evaluation of food crops grown on soil treated with BHC against the Colorado beetle (pp. 117–121, German summary p. 303). Experiments in the Soviet Union showed that potatoes and wheat grown on soil treated with BHC containing various percentages of γ isomer as well as impurities are not toxic to laboratory animals, but that the flavour of the potatoes was impaired and the wheat contained residues of BHC.

TOSTANOVSKAYA (A. A.), SEREBRYANAYA (S. G.) & ANTONOVICH (E. A.). Results and prospects of the investigation of chemicals used in the control of the Colorado beetle and of food products exposed to them (pp. 122–129, German summary p. 304). Tests in the Ukraine showed that BHC and chlordane should not be applied to soil in which potatoes are to be grown, but that γ BHC is promising. The development of insecticides that do not affect flavour or accumulate in soil is desirable.

SAZONOVA (N. A.). The toxicity of chlordane to warm-blooded animals (pp. 130–133, German summary p. 305). Chlordane possesses both acute and chronic toxicity to warm-blooded animals, even when administered in small quantities, and is eliminated from the body only slowly. A content of 1–5 parts chlordane per million in foodstuffs is dangerous if taken over a period.

VOLKOVA (A. P.). The toxicity of γ BHC to warm-blooded animals (pp. 134–137, German summary p. 306). γ BHC is a nerve poison 4–10 times as toxic to warm-blooded animals as technical BHC and accumulates in the body. Quantities of even 5 parts per million in food have toxic effects on animals and on the progeny of bearing females.

BURKATSKAYA (E. N.). **The toxicology of chemical poisons used for the control of the Colorado beetle and a hygienic evaluation of working conditions during their use** (pp. 138-142, German summary p. 307). The chemicals concerned in this review of the hazards to workers applying insecticides include BHC, chlordane and DDT, and the inhalation of dusts is the method of contamination considered.

BURDA (N. I.). **The effect of chemicals introduced into the soil on the growth, yield, seed and flavour of vegetable crops and potatoes** (pp. 143-149, 2 refs., German summary p. 308). Soil treatment with BHC has little effect on the germination or yield of potatoes and controls wireworms, but affects the flavour of the tubers.

BUKASOV (S. M.). **Initial material for the breeding of potato varieties resistant to the Colorado beetle** (pp. 150-157, 14 refs., German summary pp. 309-310). A collection of over 80 species of *Solanum* at Leningrad is useful for breeding programmes designed to produce potatoes resistant to *L. decemlineata*, but is insufficient for a solution of the problem, and further material should be obtained from Mexico and from America. The results achieved are reviewed.

SCHREIBER (K.). **Substances contained in solanaceous plants and their resistance to the Colorado beetle** (pp. 158-168, 4 figs., 13 refs., German summary p. 311). Plant substances concerned in the problem of resistance to a given insect can be classified as those that actually protect the plant from attack and those necessary for the development of the insect; absence of the latter may confer an apparent resistance. Knowledge of these substances in the potato is reviewed with respect to *L. decemlineata*.

KOMIZERKO (E. I.). **Biochemical characteristics of resistance in potato to the Colorado beetle** (pp. 169-173, 12 refs., German summary p. 312). Little is known of the biochemical nature of resistance to *L. decemlineata* in wild species of *Solanum* that contain no demissin or of the precise effect of plant constituents in the physiology of the beetle. Differences in this respect have been found in the upper and lower leaves of the potato plant. Young upper leaves are preferred by the larvae, presumably because of their amino-protein content.

KAMERAZ (A. Ya.). **Selection of potato for resistance to the Colorado beetle** (pp. 174-182, 8 refs., German summary p. 313). This is a review of work in the Soviet Union on the production of hybrid potatoes resistant to *L. decemlineata*. Species of *Solanum* of the series *Glabrescentia* seem promising.

SLEPUSHKINA (G. P.). **Selection of varieties of potato resistant to the Colorado beetle and methods of evaluating their resistance to the beetle in mass selection work for that purpose** (pp. 183-192, 14 refs., German summary p. 314). Five species of *Solanum* found promising in crossing with potato for resistance to *L. decemlineata* are mentioned. The production of varieties toxic to the beetle is difficult, and attention is best directed to vigorous forms that readily regenerate after attack. Methods of proceeding in breeding tests are reviewed.

PRYANISHNIKOVA (E. N.). **Resistance of plants to the Colorado beetle and methods of evaluating it (Summary)** (pp. 193-194). Plants are best tested for resistance to *L. decemlineata* under constant hygrostat conditions, and conditions of light and temperature affect the results. The leaves must be changed frequently.

GONTYUROV (I. M.). **Parallelism in the resistance of potato to *Epilachna vigintioctomaculata* Motsch. and the Colorado Beetle (*Leptinotarsa decemlineata* Say)** (pp. 195-203, 7 refs., German summary p. 315). Biological

similarities between *Epilachna vigintioctomaculata* Motsch. and *L. decemlineata* and their reactions to resistant plants have permitted breeding experiments for the production of potatoes resistant to the latter to be carried out in the Soviet Far East, where the beetle does not occur.

MEIER-BODE (H.). **The organisation of the production of plant-protection chemicals in the German Democratic Republic** (pp. 204-217, 10 figs., German summary pp. 316-317). The production of insecticides and other plant-protection chemicals in eastern Germany is regulated by law, and the various steps taken before a new product is marketed are described.

ARBUZOV (B. A.). **Some results of the synthesis of organophosphorus compounds in the A.E. Arbuzov Chemical Institute of the Kazan branch of the Soviet Academy of Sciences** (pp. 218-229, German summary p. 318). This is a detailed review of the numerous organophosphorus compounds prepared at the Arbuzov Institute for testing as insecticides. They are tested against the grain weevil [*Sitophilus granarius* (L.)] and occasionally against *L. decemlineata*.

SMRZ (R.). **Investigations in the field of insecticides in the Czechoslovak Republic, especially as regards the control of the Colorado beetle** (pp. 230-247, 9 figs., 10 refs., German summary p. 319). The insecticides used against *L. decemlineata* in Czechoslovakia are reviewed. The most important are DDT dusts, but γ BHC is also used and Potasan is promising. Mixtures of two insecticides, such as γ BHC and Potasan, are recommended.

KABACHNIK (M. I.). **The synthesis of organophosphorus compounds (Summary)** (pp. 248-249). This is a review of work in the Soviet Union in which over 300 phosphorus compounds have been synthesised and 150 tested as insecticides.

MASHENTSEV (A. I.). **The testing of derivatives of carbon bisulphide on the Colorado beetle** (pp. 250-254, German summary p. 320). In tests of various derivatives of carbon bisulphide as fumigants against adults of *L. decemlineata*, the best results were obtained with the methyl-ethylene ether of phenylimidodithiocarbonic acid, the structural formula of which is given and which gave complete mortality at a concentration of 4.5 mg. per litre, as compared with 25 mg. for carbon bisulphide and 35 mg. for ethylene dichloride.

MEL'NIKOV (N. N.). **The synthesis of some new insecticides** (pp. 255-266, German summary p. 321). This is a review of work in the Soviet Union on the development of insecticides with reduced toxicity for man. The groups investigated were organic phosphorus compounds, haloderivatives of hydrocarbons and esters of carbamic acid. Full details are given, chiefly in tabular form.

JERMY (T.). **Some results of research on the Colorado beetle in Hungary** (pp. 267-277, 2 figs., 18 refs., German summary pp. 322-323). Investigations in Hungary showed that the overwintered adults of *L. decemlineata* resume activity in spring over a period of about two months, independently of soil or air temperatures. Before they leave the soil, they spend some time in chambers just beneath the surface with an opening to the air. They wander on the soil surface before feeding. The winter diapause is prolonged, beginning as early as the beginning of August in many beetles of the first generation, and photoperiod is of importance in determining this [cf. 47 358]. Food specialisation becomes less intense during development; whereas the young larvae do not survive on *Solanum nigrum* or *Datura stramonium*, young adults readily accept these weeds and overwinter normally after feeding on them. Food-plant selection depends mainly on taste [47 485]. Recommendations are made for control by means of insecticides but it is recognised that these are harmful to beneficial insects.

GORÝSHIN (N. I.). **Photoperiodic reaction of the Colorado beetle (Summary)** (p. 278). The effect of photoperiod in initiating the diapause in *L. decemlineata* [cf. 47 358] has been confirmed in eastern Germany, but temperature also plays a part, an increase in temperature decreasing the critical day length.

LANDA (V.). **A fixation phenomenon** (p. 279). Males of *L. decemlineata* have been found to be more susceptible than females to insecticides. A similar phenomenon has been observed in *Melolontha* in Czechoslovakia and has been found to be due to the earlier sexual maturity of the males and their resulting greater relative physiological age. However, even sublethal doses of BHC reduce the number of eggs laid by the females.

MASLENNIKOVA (V. A.). **On the conditions determining the diapause of the parasitic Hymenoptera, *Apanteles glomeratus* (L.) (Braconidae) and *Pteromalus puparum* (L.) (Chalcididae).** [In Russian.]—Rev. Ent. URSS 37 pt. 3 pp. 538–545, 3 graphs, 8 refs. Moscow, 1958. (With a summary in English.)

In studies carried out in the laboratory in 1956, it was found that *Apanteles glomeratus* (L.), when overwintering as a first-instar larva in the diapause larva of *Aporia crataegi* (L.), reacted to environmental influences in the same way as the host. However, when it parasitised *Pieris brassicae* (L.), which it leaves before overwintering, though temperature and photoperiod influenced the diapause of the parasite larva while it was in the host, the reactions of host and parasite later differed and the seasonal development of the parasite was independent of that of the host. *Pteromalus puparum* (L.), which was studied as a parasite of *Pieris* spp. and which overwinters as a larva in the host pupa, was largely and sometimes entirely independent of the host in its reactions to environmental factors, but these still determined the onset of diapause, the physiological condition of the host having little direct effect on it.

KAMENKOVA (K. V.). **The bionomics and ecology of *Dolycoris baccarum* (L.), a supplementary host of the egg parasites of *Eurygaster integriceps* Put. in the Krasnodar region.** [In Russian.]—Rev. Ent. URSS 37 pt. 3 pp. 563–579, 6 figs., 15 refs. Moscow, 1958. (With a summary in English.)

The eggs of *Eurygaster integriceps* Put. are attacked in the Soviet Union by 13 species of parasites, chiefly Scelionids [cf. R.A.E., A 48 347], which are able to maintain high populations, after *Eurygaster* has left the grain fields and flown to its winter quarters, by multiplying in the eggs of other Pentatomids. The bionomics and ecology of one such host, *Dolycoris baccarum* (L.), were studied in 1950–52 in northern Krasnodar, where it was the most important of eight observed. It has two generations a year, and migrated at harvest from winter wheat to other plants, notably sunflower [*Helianthus annuus*], tobacco, *Hyoscyamus albus* and thorn-apple [*Datura stramonium*], on which the eggs of the overwintering generation were laid. These suffered 72·5–98·3 per cent. parasitism.

CHUMAKOVA (B. M.). **The parasites of *Phytometra gamma* L. in the Leningrad region and their importance in the reduction of the abundance of this pest.** [In Russian.]—Rev. Ent. URSS 37 pt. 3 pp. 597–602, 9 refs. Moscow, 1958. (With a summary in English.)

Autographa (Phytometra) gamma (L.) injures many cultivated plants in the Leningrad region. During the most recent outbreak, studies were made

on the identity and importance of its parasites. Altogether, six species of Hymenoptera and three Tachinids were reared, and the most important were *Apanteles congestus* (Nees) and *Stenichneumon culpator* (Schr.) [cf. R.A.E., A 38 146], which attacked the larvae and pupae, respectively. Parasitism did not exceed 29 per cent., owing to the ability of the parasites to develop in other hosts.

BATIASHVILI (I. D.). Pests of continental and subtropical fruit crops. [In Russian.]—9½ × 6½ in., 454 pp., 16 col. pls., 133 figs., 14 pp. refs. Tiflis, Gruz. sel'skokh. Inst., 1959. Price 14 rub. 60 kop.

This book on insects and mites infesting fruit trees and vines in the south of the Soviet Union, notably in Georgia, consists of short introductory sections on the origin of the arthropod fauna concerned, the distribution of the species, the damage caused and the various methods of control available, followed by sections on the pests, arranged under the plants and the parts of them attacked, with information on their appearance, distribution, food-plant range, importance, bionomics, ecology, natural enemies and control.

HOCHMUT (R.). Příspěvek k poznání morfologie, bionomie a populační dynamiky obaleče hlohového (*Cacoecia crataegana* Hb.). [A contribution to the study of the morphology, bionomics and population dynamics of *Archips crataegana*.]—Práce výzkum. Ustavů lesn. ČSR 16 pp. 23–58, 19 figs., 37 refs. Prague, 1959. (With summaries in Russian & German.)

In 1956–58, a mass outbreak of *Archips (Cacoecia) crataegana* (Hb.), all stages of which are described, occurred in low-lying, flooded oak forests in Upper Moravia and caused serious damage over about 4,000 acres [cf. R.A.E., A 49 46]. Investigations on the bionomics of this Tortricid showed that the adults emerged in June or July and that males and unfertilised and fertilised females lived, on an average, for 13, 14 and 12 days, respectively. The eggs were laid mainly on the south-eastern side of the trunks of oak and other trees, 8–12 ft. above the ground, and, after developing for a few days, they overwintered in diapause. The larvae hatched in April or May and fed in the laboratory for 20–32 days. In the field, they completed their development on the undergrowth when the trees had been defoliated and also fed on the needles of conifers. Pupation usually took place in curled leaves, mostly in early June. The outbreak reached its peak in 1957, when an epizootic, caused by *Pseudomonas chlororaphis*, began in a small area and killed 97 per cent. of the late-instar larvae and 19 per cent. of the pupae. Ichneumonid parasites, particularly *Itoplectis maculator* (F.), killed 27 per cent. of the pupae, and infestation in 1958 was reduced by 98.9 per cent.

NOVÁK (V.). Výsledky provozních pokusů s hubením kůrovců v chemicky preparovaných smrechích. [The results of experiments on the control of bark-beetles by chemical means on a commercial scale.]—Práce výzkum. Ustavů lesn. ČSR 16 pp. 59–82, 5 figs., 4 fldg. tables, 26 refs. Prague, 1959. (With summaries in Russian & German.)

Injection of sodium arsenite into spruce trees to render them toxic to bark-beetles [cf. R.A.E., A 42 234] was tested in Czechoslovakia in 1957 in the

area of a mass outbreak of *Ips typographus* (L.), *I. amitinus* Eichh. and *I. (Pityogenes) chalcographus* (L.). The poison was introduced into infested trees during chemical barking and resulted in 51–90 per cent. kill of the beetles that attacked them, though in some cases the bark was impervious to the poison. The method proved economically beneficial, but is recommended only in cases of severe infestation of standing trees or when labour shortage would result in delays in the normal treatment.

KOLUBAJIV (S.). **Orientační pokusy s umělým chovem drobněnky rodu *Trichogramma* z hmyzích lesních škůdců.** [Experiments on the artificial rearing of a species of *Trichogramma* from injurious forest insects.]—*Sborn. čsl. Akad. zeměd. Věd Lesnické* 5 (32) pt. 12 pp. 1057–1070, 2 pls., 1 fig., 74 refs. Prague, 1959. (With summaries in Russian and German.)

Trichogramma cacociae pini Meier was reared from eggs of *Cephalcia abietis* (L.) on spruce in Czechoslovakia, where the percentage parasitised reached 80 in parts of two forest districts in 1957–58. Part of the last generation of the parasite was found to overwinter in the larval stage in the host eggs. Eggs of *C. abietis* were parasitised in the laboratory, but attempts to rear the parasite in those of other insects, including *Sitotroga cerealella* (Ol.), failed. The problem of selecting suitable hosts for breeding species of *Trichogramma* in the laboratory is discussed; the difficulty of obtaining a sufficient number of eggs of *C. abietis* from the crowns of spruce trees in Czechoslovakia renders an alternative host essential in the case of *T. c. pini*.

KEVE (A.) & REICHART (G.). **Die Rolle der Vögel bei der Abwehr des amerikanischen Bärenspinners.** [The rôle of birds in the control of *Hyphantria cunea*.]—*Falke* 7 no. 1 pp. 20–26, 10 figs., 29 refs. Leipzig, 1960.

This is a review of the part played by various wild birds in controlling *Hyphantria cunea* (Dru.) in Hungary. Larvae, pupae and adults are attacked, and sparrows (*Passer domesticus* and *P. montanus*) are the most important of the birds in destroying them.

DONAUBAUER (E.). **Über eine Mykose der Latenzzarve von *Cephaleia abietis* L.** [On a mycosis of the resting larvae of *Cephaleia abietis*.]—*Sydotia* (2) 13 pt. 1–6 pp. 183–222, 12 figs., 40 refs. Horn, Austria, 1959.

An outbreak of *Cephaleia abietis* (L.) began on spruce near Mariabrunn, Austria, in 1956. The population was estimated by counts of larvae that entered the soil, and observations in the course of this work showed that many of the larvae were attacked by *Beauveria bassiana*. The fungus was studied in the laboratory, and observations on it, its development and the symptoms caused by it are described. It entered the larvae through the spiracles, as well as directly through the integument, which was the usual route. Introduction of the fungus into soil containing healthy larvae increased mortality in the laboratory, but had no effect in the field.

FABER (W.). **Untersuchungen über ein katastrophales Auftreten der Sattelmücke (*Haplodiplosis equestris* Wagn.) in Osttirol.** [Investigations on a catastrophic outbreak of *H. equestris* in East Tyrol.]—**Pflanzenschutzberichte** **23** pt. 5-6 pp. 65-90, 20 figs., 23 refs. Vienna, 1959. (With a summary in English.)

An outbreak of *Haplodiplosis equestris* (Wagn.) has been in progress since about 1954 on cereal crops, chiefly summer wheat and barley, in an isolated valley at over 3,000 ft. in the East Tyrol region of Austria. All stages of the Cecidomyiid and observations on its bionomics and control, for which DDT sprays proved effective, are described.

MAKSYMOW (J. K.). **Beitrag zur Biologie und Ökologie des Grauen Lärchenwicklers *Zeiraphera griseana* (Hb.) (Lepidoptera, Tortricidae) im Engadin.** [A contribution to the bionomics and ecology of the grey larch Tortricid, *Enarmonia griseana*, in the Engadine.]—**Mitt. schweiz. Anst. forstl. Versuchsw.** **35** pt. 3 pp. 277-315, 6 pls. (1 col.), 9 figs., 42 refs. Zurich, 1959. (With summaries in French, Italian & English.)

BOVEY (P.) & MAKSYMOW (J. K.). **Le problème des races biologiques chez la tordeuse grise du mélèze *Zeiraphera griseana* (Hb.). (Note préliminaire.)**—**Vjschr. naturf. Ges. Zürich** **104** (Festschr. Steiner) pp. 264-274, 5 figs., 21 refs. Zurich, 1959. (With summaries in German & English.)

BALTENSWEILER (W.). **Zur Kenntnis der Parasiten des Grauen Lärchenwicklers (*Zeiraphera griseana* Hübner) im Oberengadin. Ihre Biologie und Bedeutung während der Gradation von 1949 bis 1958.** [A contribution to the knowledge of the parasites of the grey larch Tortricid (*Enarmonia griseana*) in the Upper Engadine. Their bionomics and importance during the outbreak of 1949-58.]—**Mitt. schweiz. Anst. forstl. Versuchsw.** **34** pt. 6 pp. 399-478, 7 pls. (1 fldg.), 17 figs., 66 refs. Zurich, 1958. (With summaries in French, Italian & English.)

These three papers form parts of a series recording investigations on variations in population of *Enarmonia* (*Zeiraphera*) *griseana* (Hb.) carried out during an outbreak on larch in 1949-58 in the Swiss alpine region of the Engadine [cf. R.A.E., A **48** 141]. Observations on the bionomics and ecology of the Tortricid are reported in the first, in which it is stated that the eggs are laid in July-August, at the rate of some 40-80 per female, with a maximum of about 160, and overwinter until May, and that development of the larvae and pupae lasts 70-80 days. The information in the second on races of the moth on larch and cembran pine (*Pinus cembra*) has already been noticed [loc. cit.]. The third is a detailed study of the insect parasites of the two races. Information is given on the bionomics of the nine most important of the 33 found, and their effectiveness is compared with that of the virus disease also present [47 214]. The parasites chiefly responsible for the collapse of the outbreak on larch were *Phytodietus* sp. [cf. **48** 155] and Eulophids.

HORBER (E.). **Verbesserte Methode zur Aufzucht und Haltung von Engerlingen des Feldmaikäfers (*Melolontha vulgaris* F.) im Laboratorium.** [Improved method of rearing and maintaining larvae of *M. melolontha* in the laboratory.]—**Landw. Jb. Schweiz** **73** pt. 4 pp. 361-370, 1 fig., 8 refs. Berne, 1959. (With summaries in French & English.)

In the method described, larvae of *Melolontha melolontha* (L.) (*vulgaris* F.) are reared singly in vermiculite (instead of soil) [cf. R.A.E., A **48** 163] in

small aluminium boxes, and roots of dandelion (*Taraxacum officinale*) are provided as food, the vermiculite and roots being renewed every ten days. Mortality over long periods averaged only 10 per cent.

KLINGLER (J.). **Biologische Beobachtungen über den Gefurchten Dickmaulrüssler (*Otiorhynchus sulcatus* Fabr.) während seines Massenauftrittens der letzten Jahre auf Reben der deutschen Schweiz.** [Observations on the bionomics of *O. sulcatus* during an outbreak in recent years on vines in German Switzerland.]—*Landw. Jb. Schweiz* 73 pt. 5 pp. 409–438, 19 figs., 45 refs. Berne, 1959.

An outbreak of *Otiorhynchus sulcatus* (F.) on vines began in German Switzerland in 1955, and investigations on the bionomics of the weevil, which had hitherto been of little importance, were begun later in the year and continued until 1957. The results showed that there was only one generation a year, winter being passed in the prepupal stage. Adult emergence began in late May or early June and continued during the summer. No males were observed. The females fed before becoming sexually mature, and most of them oviposited after 4–5 weeks, though a few overwintered and did not lay eggs until the following spring. Eggs were found mainly at the bases of the stems, beneath the bark or in the soil. They hatched in about ten days at 25°C. [77°F.] and in about 60 days at 10°C. [50°F.], and the larvae fed on the roots and overwintered as such or as prepupae. Pupation occurred in spring, and the pupal stage lasted about ten days at 25°C. and about 32 days at 13°C. [55·4°F.]. The adults left the cocoons after about a week. The damage caused is described, that caused by the larvae being the more severe.

MÜNSTER (J.) & JOSEPH (E.). **Lutte contre la jaunisse sur betteraves sucrières à l'aide de traitements systémiques préventifs.**—*Landw. Jb. Schweiz* 73 pt. 6 pp. 579–595, 2 figs., 10 refs. Berne, 1959. (With summaries in German, English & Italian.)

Details are given of experiments in Switzerland in 1957–58 in which up to 90 per cent. reduction of infection of sugar-beet with the yellows virus was given by spraying with 0·06 per cent. thiometon. Two applications were made, when *Myzus persicae* (Sulz.) first appeared on the plants and again 6–12 days later, depending on the size of the aphid population.

BOLZANI (P.), CANEVASCINI (V.) & BAGGIOLINI (M.). **Esperimenti di lotta contro la tignola orientale del pesco (*Laspeyresia molesta* Busck), effettuati nei pescheti ticinesi dal 1953 al 1958.** [Experiments on the control of the oriental peach moth (*Cydia molesta*), carried out in peach orchards in the Ticino from 1953 to 1958.]—*Landw. Jb. Schweiz* 73 pt. 6 pp. 621–644, 6 figs. (1 fldg.), 12 refs. Berne, 1959. (With summaries in French, German & English.)

The following is based on the authors' summary. *Cydia* (*Laspeyresia*) *molesta* (Busck) has caused increased injury to late peaches in the Swiss canton of the Ticino, and various methods of control were tested in 1953–58. The results showed that only a complete schedule of 5–6 sprays from June to August gave complete protection against heavy infestation. Diazinon is the only insecticide recommended; it was used at 0·2 lb. per 100 gal. in an emulsion spray.

MATHYS (G.) & TENCALLA (Y.). **Note préliminaire sur la biologie et la valeur prédatrice de *Proctolaelaps hypudaei* Oudms. (Acarien, Mesostigmata, Aceosejidae).**—*Landw. Jb. Schweiz* **73** pt. 6 pp. 645–654, 6 figs., 7 refs. Berne, 1959. (With summaries in German, English & Italian.)

Proctolaelaps hypudaei (Oudm.), an Aceosejid mite, is common on fruit trees in Switzerland, migrating to them from the soil, and apparently affords some control of *Tetranychus telarius* (L.) (*urticae* Koch), though it is mainly saprophagous or cannibalistic in habit. Its bionomics are described from laboratory observations, in which development lasted about ten days; the prey is completely devoured.

HEINZE (K.). **Beitrag zur Ermittlung neuer Überträger für phytopathogene Viren.** [Contribution to the finding of new vectors for phytopathogenic viruses.]—*Z. PflKrankh.* **66** pt. 7 pp. 391–395, 8 refs. Stuttgart, 1959. (With a summary in English.)

In the experiments described, turnip-mosaic virus, a strain of potato virus Y causing browning of the mid-ribs of tobacco, the tomato aspermy virus, potato leaf-roll virus and cucumber-mosaic virus were all transmitted by *Rhopalosiphoninus* (*Myzotoxoptera*) *staphyleae tulipaellus* (Theo.) and some of them also by various other aphids. *Myzus* (*Neomyzus*) *circumflexus* (Buckt.) proved a good vector of the beet-yellows virus. Factors affecting transmission are discussed.

WAEDD (M.). **Ein Beitrag zur Biologie der Weizengallmücken *Contarinia tritici* Kirby und *Sitodiplosis mosellana* Géhin. Die Fähigkeit der Weizengallmückenlarven zur mehrfachen Kokonbildung.** [A contribution to the bionomics of the wheat gall-midges, *C. tritici* and *S. mosellana*. The ability of the larvae to form repeated cocoons.]—*Z. PflKrankh.* **66** pt. 8 pp. 508–514, 4 figs., 2 refs. Stuttgart, 1959. (With a summary in English.)

An account is given of observations and experiments in Germany on the ability of the overwintered larvae of the wheat gall-midges, *Contarinia tritici* (Kby.) and *Sitodiplosis mosellana* (Géh.), to spin fresh cocoons before pupating; in the laboratory, some did so seven times, but not all pupated in cocoons. The overwintering and secondary cocoons are described.

WELTZIEN (H. C.). **Ergebnisse einiger Freilandversuche zur Bekämpfung der Luzerneblütengallmücke (*Contarinia medicaginis* Kieff.) im Jahre 1958.** [Results of a field test on the control of the lucerne gall-midge (*C. medicaginis*) in the year 1958.]—*Z. PflKrankh.* **66** pt. 8 pp. 515–519, 1 graph, 8 refs. Stuttgart, 1959. (With a summary in English.)

In tests in south-western Germany in 1958, two spray applications of a proprietary mixture of DDT and BHC before blossoming gave much better control of *Contarinia medicaginis* Kieff. on lucerne grown for seed than did two of Thiodan during blossoming. Both treatments significantly increased the yield.

SCHWARZ (R.). **Erhöhte Anlockung von *Macrosteles laevis* Rib. (Hom. Cicadina) durch Attraktivflächen.** [Increased trapping of *M. laevis* by attractive surfaces.]—Z. PflKrankh. **66** pt. 9 pp. 589–590, 5 refs. Stuttgart, 1959. (With a summary in English.)

In experiments in Germany, four times as many adults of *Macrosteles laevis* (Ribaut) were caught near a grain field on plants coated with bands of adhesive when yellow dishes were placed beneath the plants as when they were not. The ratio of males to females was 4:1, whereas females outnumbered males in net catches on the grain.

FRITZSCHE (R.) & WOLFGANG (H.). **Beeinflussung des Saatgutwertes und der Backqualität des Weizens durch Weizengallmückenbefall.** [Effect of infestation by wheat gall-midges on the seed value and baking quality of wheat.]—Z. PflKrankh. **66** pt. 10 pp. 645–653, 3 figs., 20 refs. Stuttgart, 1959. (With a summary in English.)

Investigations in Germany showed that infestation of wheat by *Contarinia tritici* (Kby.) and *Sitodiplosis mosellana* (Géh.) decreases the weight, vigour, germinating ability and sprouting of the seeds and also the baking quality of the flour prepared from them. The rate of infestation was correlated positively with the ash and gluten content and negatively with the content of starch, crude fibre and reducing sugars and with the quality of the gluten.

NOLTE (H. W.). **Untersuchungen zum Farbensehen des Rapsglanzkäfers (*Meligethes aeneus* F.). I. Die Reaktion des Rapsglanzkäfers auf Farben und die ökologische Bedeutung des Farbensehens.** [Investigations on the colour vision of *M. aeneus*. I. The reaction of *M. aeneus* to colours and the ecological importance of colour vision.]—Biol. Zbl. **78** pt. 1 pp. 63–107, 13 figs., 4½ pp. refs. Leipzig, 1959. **II. Ergebnisse für die Praxis des Schädlingswarndienstes.** [II. Results relating to the operation of the pest warning service.]—Z. angew. Zool. **46** pt. 1 pp. 11–33, 8 figs., 33 refs. Berlin, 1959. (With a summary in English.)

Since it had been observed that the yellow dishes used to trap aphids [cf. R.A.E., A **39** 359] were attractive to *Meligethes aeneus* (F.), detailed investigations were carried out in Germany in 1952–57 on the reactions of this Nitidulid to various colours, and the following is taken largely from the author's summary of the first part of this paper, in which the results are recorded. Although the scent of substances in rape appeared to have some attraction for the ovipositing females, this was secondary to visual attraction and had no effect over a distance. Adults reacted to at least three distinct colour ranges, ultraviolet to dark blue, light blue to dark green, and light green to orange, the first and last being attractive and the second repellent. The amount of ultraviolet light present was an important factor affecting the time at which the adults entered and left their winter quarters, and red and white flowers were perceived largely through the reflection of ultraviolet light by them; white, however, repelled when the amount of ultraviolet reflected was very great or very small. The presence of ultraviolet was probably also conducive to the perception of blue and violet. When yellow dishes were placed against various coloured or other backgrounds, those placed among rape attracted most adults, followed in order of decreasing effectiveness by those in fallow fields and those on red, light green, black, dark green, blue and white backgrounds. Unlike yellow dishes placed at crop height, those at ground level in a full-grown crop were not necessarily preferred to those of other colours.

In the second part, which contains some of the information already reported in the first, the results are given of further investigations showing that the amount of sunshine, as distinct from temperature, had no direct effect on the numbers of adults caught in yellow dishes. Movement to rape was active rather than passive, but activity in the crop decreased with increase in wind speed. Few beetles were trapped when the relative humidity fell below 60 per cent. The bearing of the results on the use of trap-dishes for forecasting infestation is discussed. One per field is considered sufficient.

FRITZSCHE (R.). **Untersuchungen zur Bekämpfung der Spinnmilben (Tetranychus urticae Koch) an Stangen- und Buschbohnen (Phaseolus vulgaris L.).** [Investigations on the control of *T. telarius* on runner and dwarf beans.]—*Z. angew. Zool.* **46** pt. 1 pp. 35–58, 31 refs. Berlin, 1959. (With a summary in English.)

The results are given of investigations in central Germany in 1955–58 on the effectiveness of chemicals, mostly in commercial preparations, against *Tetranychus telarius* (L.) (*urticae* Koch) on beans. In laboratory tests, immature stages or summer females were sprayed directly or placed on the leaves of plants bearing dried spray deposits, and mortality was assessed over 8–10 days. Wettable sulphur did not give adequate control of adults. Parathion and methyl-parathion gave good initial kill and complete mortality after 2 and 3 days, respectively, when applied directly, and both gave complete kill in two days when the mites were exposed to dried deposits. Similar results were obtained with larvae, but control of eggs was not satisfactory. Three systemic materials, demeton, methyl-demeton and a compound similar to the latter, gave good initial control of adults when applied directly and complete mortality in 3, 2 and 2 days, respectively, and the effect on larvae was similar. Dried deposits had a slightly slower initial action on the adults, methyl-demeton giving complete kill in two days and the others in three. All were effective in sprays applied to the eggs. Malathion or other maleic-acid derivatives gave good or fairly good initial kill of adults when applied directly, one malathion preparation giving complete kill in two days, but were somewhat slower in action in sprays applied to the larvae and when used in the form of dried deposits against the adults. Their ovicidal effect was unsatisfactory. Diazinon gave complete or nearly complete kill of adults in two days in direct sprays but was not satisfactory against the eggs. Among selective acaricides, fenson, chlorfenson and chlorobenzilate all gave good control of the eggs in direct sprays, and the first two also in the form of dried deposits. They usually gave good control of larvae in five days when applied directly, and the results for deposits were similar, but control of adults was less satisfactory. Mortality of larvae of two natural enemies of the mites, *Anthocoris nemorum* (L.) and *Scolothrips longicornis* Priesn., following direct application of sprays of these materials, was low. Tedion was the most effective ovicide tested, and gave complete kill of eggs both in direct sprays and as a deposit. It was also fairly effective against the larvae, giving complete kill in five days in direct sprays and in six in deposits.

Comparable results were obtained with the various materials on beans in the field, and it is concluded that the best form of treatment comprises one application of a systemic acaricide or 1–2 applications of a non-systemic phosphorus compound when the mites first appear on the plants, with a further treatment with a selective acaricide at the end of July.

SANDERS (W.). **Beiträge zur Morphologie und Bionomie von *Nitidula bipunctata* L.** [Contributions to the morphology and bionomics of *N. bipunctata*.]—*Z. angew. Zool.* **45** pt. 3 pp. 315–336, 5 figs., 6 refs. Berlin, 1958. **Die Bedeutung des Verhaltens von *Nitidula bipunctata* L. für das Zustandekommen von Massenauftreten in Räucherkammern.** [The importance of the behaviour of *N. bipunctata* for the occurrence of outbreaks in smoking chambers.]—*Op. cit.* **46** pt. 1 pp. 63–98, 2 graphs, 22 refs. 1959. (With summaries in English.)

Nitidula bipunctata (L.) was found infesting meat in smoking chambers near Oldenburg in 1951, and considerable infestation was reported in such premises there and to the south, near Bersenbrück, in 1952–55. In the first of these papers, all stages of this Nitidulid are described, its distribution is summarised and investigations on its bionomics in the field and laboratory in 1954–55 are recorded.

Few adults were taken in the field. They occurred mostly in sparsely wooded, well-watered districts, but the presence of food (for which decayed carrion was preferred) was probably the most important factor. Considerable numbers were taken near a dog-breeding establishment, where bones were available. They were observed in May, and numbers were highest in the smoking chambers from 19th May to 5th June in 1954 and slightly later in 1955. Oviposition occurred in slits or folds in carrion flesh or in holes in bones, and the full-fed larvae pupated in the soil.

In the laboratory, the females fed for a minimum of 3–4 days (at 23°C. [73·4°F.]) before ovipositing, maturation being more rapid on bone-marrow than on bacon. More eggs were laid at about 23°C. than at lower temperatures, and the numbers laid on bacon over six months were 14–200 per female, with an average of 96. When the beetles were allowed to feed on bone-marrow, the numbers of eggs laid were very high for a short period, some 3,400 being deposited in a month when 62 individuals of both sexes were transferred to it from bacon, but this high rate of oviposition did not persist. Adults lived for 13–15 months. The duration of the egg stage ranged from 2·5 days at 32°C. [89·6°F.] to 25 days at 12°C. [53·6°F.]; low relative humidity increased egg mortality at low temperatures. The duration of larval development ranged from about 19 days at 28°C. [82·4°F.] and about 20 days at 32°C. to 30–35 days at 20°C. [68°F.] on tender bacon and was 10–20 per cent. shorter on bone-marrow. The full-fed larvae wandered in search of pupation sites and entered moist substrates. The prepupal stage lasted 5·5 days at 20°C., and the pupal stage 7 days at 32°C. and 14·5 at 20°C.

In the second paper, detailed laboratory investigations are described concerning the behaviour of *N. bipunctata* in relation to various environmental conditions, and the factors favouring infestation in smoking chambers are discussed. The following is based mainly on the author's summary of the results. The adults preferred a temperature of 25°C. [77°F.], high relative humidity and low light intensity. They were thigmotactic, but flew when requiring food. At such times, they were attracted by the smell of slightly decayed meat or bacon, and preferred unsalted meat or bone-marrow. Flight was hindered by strong air currents. The larvae were attracted by the smell of bacon or bone-marrow, particularly when these were rancid, and preferred tender, unsalted material. The larvae were negatively phototactic at first, but became positively phototactic when full-fed. Variation in relative humidity had no effect on younger larvae. Although smoking chambers evidently provide a favourable environment, the frequency of severe infestation in them is limited by the smallness of the normal field population.

KRISTENSEN (H. R.) & CHRISTENSEN (M.). **Virusgulsort hos bederoer. I.** [Virus yellows of beet. I.]—*Tidsskr. Planteavl* **62** no. 3 pp. 369–419, 5 figs., 52 refs.; also as *Beretn. Forsøgsv. PlKult.* no. 565. Copenhagen, 1958. (With a summary in English.)

Work on the yellows virus of beet in Denmark in recent years, which is reviewed, included investigations on the aphid vectors, of which the chief is *Myzus persicae* (Sulz.). It was found that *M. persicae* overwintered to a considerable extent in beet clamps [cf. *R.A.E.*, A **44** 404]. The percentage of clamps containing this species was about 10 in 1954–56, when the percentage of infected plants in the field in September was 10–23, but 45 per cent. of the clamps were infested in the spring of 1957 and the percentage infection in the following September averaged 52. It was found by inoculation tests that the infection reduced the yield of the plants when it occurred in mid-June, but little or not at all when it occurred in August. Repeated spraying with demeton (Systox) or parathion delayed infection by the aphids and increased the yields considerably in 1954–56, and 2–3 sprays of methyl-demeton (Metasystox) gave good protection in 1957. Parathion was usually inferior to either of the others. It is concluded that spraying is profitable if correctly timed, and that it should be begun as soon as *M. persicae* appears in the field. A warning service is desirable.

AUSLAND (O.). **Gulrotflue (*Psila rosae* Fabr.) og gulrotsuger (*Trioza apicalis* Först.) bekjempelse.** [Control of the carrot fly (*P. rosae*) and the carrot psylla (*T. apicalis*)].—*Meld. Plantev.* no. 15, 61 pp., 39 refs. Oslo, 1957. (With a summary in English.)

Psila rosae (F.) and *Trioza apicalis* Först. are important pests of carrot in Norway, the first being widespread [cf. *R.A.E.*, A **46** 36] and the second occurring mainly in the south and south-east. Experiments on their control were carried out in 1953–56, and the following is based on the author's summary of the results. Where both insects occur, simultaneous control can be obtained in June–July. Spraying gave the best results, dieldrin and γ BHC (lindane) being the most reliable insecticides, and 2–3 applications at intervals of about ten days are required. Other insecticides proved less effective, or effective against *P. rosae* only. Dusts were less satisfactory, but gave good control at high rates of application; dieldrin applied to the plant rows before the eggs of *P. rosae* hatched was effective. Seed dressings gave good control of the first generation of the fly, but not of the second. Aldrin, dieldrin, γ BHC and chlordane were all satisfactory, but the first three were the best, though γ BHC sometimes reduced germination and affected the flavour of the carrots.

RYGG (T.). **Løkflue (*Hylemyia antiqua* Meig.). Undersøkelser over dens biologi og bekjempelse i Norge.** [The onion fly (*H. antiqua*). Investigations on its bionomics and control in Norway].—*Meld. Plantev.* no. 18, 56 pp., 23 figs., 42 refs. Oslo, 1960. (With a summary in English.)

Hylemyia antiqua (Mg.) is an important pest of onions wherever they are grown in Norway. Investigations on its bionomics and control were carried out in 1956–59, and the following is based on the author's summary of the results.

In the south, *H. antiqua* had two generations a year. Adults emerged from the overwintered pupae in May-June and fed for a time on wild flowering plants. Those found in onion fields were chiefly ovipositing females. In cage tests they lived for eight days without food and 28 days when honey and casein were provided. Only fed females oviposited, doing so after 12 days. The eggs were laid on the plants, frequently inside the sheath surrounding the stem, or in the soil close to the plant collar. The larvae hatched in 3-8 days and bored into the base of the stems, causing the plants to collapse, and sometimes attacking several plants each. They completed feeding in 3-4 weeks and pupated in the soil or occasionally in the onions. Some of the pupae gave rise to adults in the same year, the percentage ranging from 52 to 88, and the remainder overwintered. The first-generation adults emerged in July-August, and attack by second-generation larvae occurred mainly in August-September, but persisted until November, many larvae occurring per plant. In the north, there was only one generation a year. Hymenopterous parasites afforded little control, though several species were present, but attack by *Aleochara bilineata* Gylh. was very effective. Other Diptera found infesting onion are noted.

Various insecticides were tested for control. When the seed was to be sown directly in the field, dressing it with 5 per cent. of its weight of aldrin or dieldrin gave good protection, though germination was reduced if the seed was kept for three weeks, but trichlorphon (Dipterex) was ineffective. Aldrin, dieldrin and γ BHC (lindane) were effective in dusts applied along the row after sowing or before germination. Onion sets were treated by immersion or by dipping in water containing a wetting agent, followed by dust treatment. Infestation was light, but immersion is recommended, aldrin, dieldrin, chlordane, DDT and γ BHC being the insecticides selected. Dipping the roots of plants in a clay paste mixed with aldrin or dieldrin in emulsion form before setting out gave no protection and damaged the plants.

FJELDDALEN (J.) & STENSETH (C.). **Nye kjemiske midler for bekjempelse av jordbaermidd (Tarsonemus pallidus Banks).** [New chemicals for the control of the strawberry mite (*Stenotarsonemus pallidus*).]—*Frukt og Baer* **11** pp. 37-41, 2 figs. Oslo, 1958. (With a summary in English.)

Stenotarsonemus (Tarsonemus) pallidus (Banks) has for some years been a pest of strawberries in Norway. In tests on its control in 1956-57, emulsion concentrates containing 50 per cent. Bayer 4741 (O,O-dimethyl S-(2-ethylsulphinyl-1-methyl)ethyl phosphorothioate [cf. *R.A.E.*, A **47** 218]), 19.5 per cent. endrin, 15.2 per cent. mevinphos (Phosdrin), 35 per cent. parathion or 50 per cent. methyl-demeton and a wettable powder containing 25 per cent. Kelthane were used. Following preliminary greenhouse tests, in which methyl-demeton and Bayer 4741 proved ineffective, sprays were applied in the field. In the first series, one application of the Kelthane powder at 0.2 per cent., the endrin concentrate at 0.15 per cent. or the methyl-demeton concentrate at 0.1 per cent. after harvest was as good as one after harvest and one before flowering in the following spring, and either was superior to two, a week apart, before blossoming, which were ineffective. Endrin and Kelthane were both highly effective, and methyl-demeton unsatisfactory. In the second, two applications were made before blossoming, the endrin and mevinphos concentrates being used at 0.2 per cent., the Kelthane powder at 0.2 per cent. and the parathion concentrate at 0.06 per cent. The results were poor and variable, but two further

applications, ten days apart, after harvest were very effective, except in the case of mevinphos.

TAKSDAL (G.). **Nytt skadedyrmiddel med lovande verknad mot solbaergall-midd** (*Eriophyes ribis* Nal.). [A new toxicant with a promising effect on the black-currant mite (*Cecidophyes ribis*).]—*Frukt og Baer* **12** pp. 12–18, 2 figs., 4 refs. Oslo, 1959. (With a summary in English.)

Cecidophyes (*Eriophyes*) *ribis* (Westw.) is a major pest of black currants in the coastal districts of western and southern Norway. Sprays of lime-sulphur afford little control, and other materials were therefore compared with it in 1957–58. Good results were given by endrin, phorate (Thimet), wettable sulphur and lime-sulphur in the laboratory, and these and parathion were evaluated in the field. In one series, sprays were applied just before and just after blossoming; endrin at 0.2 per cent. of a 19.5 per cent. emulsion concentrate gave outstanding control, and the other materials were ineffective. In another, 2–5 applications of parathion gave no significant reduction. Two applications of endrin before blossoming were sufficient, an additional one before blossoming and two after harvest having no effect. Endrin is not approved for use on black currants in Norway because of its mammalian toxicity, and a less dangerous material is to be sought.

BILIOTTI (E.), GRISON (P.), MAURY (R.) & VAGO (C.). **Emploi d'une poudre à base de virus spécifique contre la chenille processionnaire du pin dans le massif du Ventoux.**—*C. R. Acad. Agric. Fr.* **45** no. 8 pp. 407–409, 10 refs. Paris, 1959.

In a test in southern France begun in early October 1958, a dust containing spores of *Smithiavirus pityocampae*, an intestinal cytoplasmic polyhedrosis virus of *Thaumetopoea pityocampa* (Schiff.) [cf. *R.A.E.*, A **48** 80], was applied by helicopter to mountain pine woods infested by larvae of that Notodontid. Observations showed that mortality began about 10th November and continued until the survivors pupated, in early February 1959. The latter represented some 3–4 per cent. of the initial population. Winter shelters were found in numbers immediately after the treatment, but little damage was done to the foliage.

LESPÈS (L.). **Essais de lutte chimique contre la sésamie** (*Sesamia non-agrioides* Lef.) **nuisible au maïs.**—*Rev. Zool. agric.* **58** no. 4–6 pp. 49–58. Talence, 1959.

Experiments on the control of *Sesamia non-agrioides* (Lef.) on maize in Morocco [cf. *R.A.E.*, A **46** 295] were continued in 1957–58. Maize sown in early April was sprayed between 20th May and the end of June, and it was found that rotenone, aldrin, dieldrin and endrin resulted in yield increases of about 30 per cent., dieldrin being the best and parathion and DDT being inferior to them, that three applications were as good as five, though two at the peak of emergence would probably be better, and that the optimum concentration for rotenone and dieldrin was 0.25 lb. per 100 gal. On irrigated maize sown in early August and sprayed from mid-August until 20th October, during the period of greatest activity of *S. non-agrioides*,

0.4 lb. dieldrin per 100 gal. gave the best results when applied at the shortest intervals (12 days). The costs of the treatments are discussed.

CHABOSSOU (F.) & RAMADIER (P.). **Essais de traitements de pré-débourrement et de printemps sur pêcher vis-à-vis de la cochenille du mûrier (*Pseudaulacaspis pentagona* Targ.).** — *Rev. Zool. agric.* **58** no. 7-9 pp. 96-106, 9 refs. Talence, 1959.

Pseudaulacaspis pentagona (Targ.) has recently become established as a pest of peach in south-western France [cf. *R.A.E.*, A **48** 486], and experiments on its control were begun in 1959. In sprays applied on 2nd February, during the dormant period, a preparation of the mayonnaise type containing 5 per cent. DNC in mineral oil diluted to 3 per cent. in water gave 85 per cent. corrected mortality and was much better than the other material tested, though treatment with preparations of parathion in oil emulsion (oleoparathions [cf. **46** 396]), prevented oviposition. The same trees were sprayed again on 13th May, when 73 per cent. of the eggs had hatched, and an oleoparathion preparation containing 3 per cent. parathion and 70 per cent. oil, diluted to 0.6 per cent., gave excellent results and led to complete control when it followed dormant treatment with the same material at 3 per cent. DDT in oil emulsion gave poor control, Sevin affected only exposed crawlers and diazinon was unsatisfactory. Details are included of earlier experiments showing that oleoparathion sprays also suppress oviposition by *Epidiaspis leperii* (Sign.) on pear.

BESTAGNO (G.) & SANTOCCHIA (A.). **Prove di disinfezione con bromuro di metile sotto vuoto, in apparecchiatura di laboratorio, di fiori di garofano attaccati da *Cacoecia* (= *Tortrix*) *pronubana* Hüb.** [Tests of the disinfection of carnation flowers attacked by *Cacoecimorpha pronubana* with methyl bromide under vacuum in laboratory apparatus.] — *Ann. Sper. agr. (N.S.)* **11** no. 4 suppl. pp. xlvii-lxxv, 8 figs., 5 graphs, 15 refs. Rome, 1957. (With a summary in English.)

The following is based on the authors' summary. In the tests described, excellent control of the larvae of *Cacoecimorpha* (*Cacoecia*) *pronubana* (Hb.) on carnations packed for export was given in winter and spring by vacuum fumigation with methyl bromide at 4 oz. per 100 cu. ft. for 90 minutes or 3 oz. per 100 cu. ft. for two hours, both at 18-20°C. [64.4-68°F.].

COSTANTINO (G.). **Lotta artificiale contro le larve e le pupe della mosca delle frutta (*Ceratitis capitata* Wied.) nel terreno mediante prodotti organici di sintesi, e particolarmente a base di ettacloro.** [Artificial control of the larvae and pupae of the fruit-fly (*C. capitata*) in the soil by synthetic organic products, particularly those based on heptachlor.] — *Ann. Sper. agr. (N.S.)* **11** no. 4 suppl. pp. cxv-cxlii, 93 refs. Rome, 1957. (With a summary in English.)

The following is based on the author's summary. The author reviews the bionomics and control of *Ceratitis capitata* (Wied.) and describes experiments in southern Italy in 1955 in which a 6 per cent. heptachlor dust scattered on the surface of soil in pots, or mixed with it, at the rate of about 1 oz. per sq. yard gave good control of full-fed larvae and pupae in the soil. Similar treatment with an emulsion was slightly less effective.

DI MARTINO (E.). **Impiego di esteri fosforici da soli e di miscele con oli bianchi nelle prove di lotta contro le cocciniglie degli agrumi nella Sicilia orientale durante gli anni 1953-54.** [The use of phosphoric esters alone and in mixtures with white oils in control tests against Coccids on *Citrus* in eastern Sicily in the years 1953-54.]—*Ann. Sper. agr. (N.S.)* **11** no. 5 suppl. pp. cliii-clxxvii, 1 fig., 15 refs. Rome, 1957. (With a summary in English.)

The following is based on the author's summary. Following preliminary tests in 1953, parathion and malathion were tested in sprays with and without white oil against *Chrysomphalus dictyospermi* (Morg.) on *Citrus* in eastern Sicily in 1954. Over 98 per cent. corrected mortality was given by emulsion sprays of about 0.05 per cent. parathion with about 0.3 per cent. white oil, and less by the other treatments. Malathion with oil was slightly less satisfactory.

PRINCIPI (M. M.). **Ricerche di morfologia e di etologia su di un Dittero Cecidomiide galligeno, la Putoniella marsupialis F. Loew, vivente su piante del gen. *Prunus*. Primi risultati.** [Investigations on the morphology and bionomics of a gall-midge, *P. marsupialis*, living on plants of the genus *Prunus*. First results.]—*Boll. Ist. Ent. Bologna* **23** pp. 35-68, 19 figs., 2½ pp. refs. Bologna, 1959. (With a summary in English.)

Putoniella marsupialis (F. Lw.), all stages of which are described, causes galls on the leaves of plum and related plants near Bologna. In observations on its bionomics in 1952-55, the adults emerged in late March or early April, and the females, which, unlike the males, flew readily, laid their eggs on the leaf buds. The larvae hatched as these were beginning to open, in early April or later, crawled over the leaves to the youngest one and fed along the main vein, causing galls to form. They became full-fed towards the end of the month or in early May, left the galls and pupated in cocoons in the soil. The pupae overwintered, and some did not give rise to adults for several years. Notes on other insects, including natural enemies of the Cecidomyiid, found in the galls are appended.

GÓMEZ-MENOR ORTEGA (J.). **Cochinillas que atacan a los frutales (Homoptera, Coccoidea: I. Familia Diaspididae).** [Coccids that attack fruit trees. I. The family Diaspididae.]—*Bol. Pat. veg. Ent. agric.* **22** (1955-56) pp. 1-105, 58 figs., 44 refs. Madrid [1957]. **II. Familias Lecanidae y Margarodidae.** [II. The families Lecaniidae and Margarodidae.]—*Op. cit.* **23** (1957-58) pp. 43-173, 68 figs., 36 refs. 1959.

Keys are given to the Coccids that infest fruit trees and vines in Spain, with information on their morphology, synonymy, food-plants, natural enemies and economic importance.

ALFARO (A.). **Observaciones sobre *Hellula undalis* F., nueva plaga de la col.** [Observations on *H. undalis*, a new pest of cabbage.]—*Bol. Pat. veg. Ent. agric.* **22** (1955-56) pp. 107-116, 6 figs., 6 refs. Madrid [1957].

Hellula undalis (F.) is recorded attacking cabbage and cauliflower in the region of Saragossa. All stages are described, and notes are given on its

bionomics and control. It had not previously been reported as a pest in Spain.

PLANES GARCÍA (S.). **Experiencias de lucha contra la mosca de las frutas (*Ceratitis capitata* Wied.), con pulverizaciones cebo de insecticidas fosforados.** [Experiments on the control of the fruit-fly (*C. capitata*) with bait-sprays of phosphorus insecticides.]—*Bol. Pat. veg. Ent. agric.* **22** (1955-56) pp. 117-127, 1 fig., 14 refs. Madrid [1957].

Tests on apricot near Valencia showed that the best control of *Ceratitis capitata* (Wied.) was given by spraying the whole of each experimental tree with 50 per cent. DDT at 0.25 per cent., which was slightly superior to the same spray applied only to the southern half of each, a spray of γ BHC (lindane) applied to the whole, or bait-sprays incorporating malathion, Chlorthion or trichlorphon (Dipterex), all with sugar. Neither DDT nor diazinon proved effective in bait-sprays.

PLANES GARCÍA (S.). **Experiencias de lucha contra las orugas de la cápsula del algodonero (*Earias insulana* Boisd. y *Platyedra gossypiella*).** [Experiments on the control of the cotton bollworms (*E. insulana* and *Pectinophora gossypiella*).]—*Bol. Pat. veg. Ent. agric.* **22** (1955-56) pp. 129-173, 17 figs. Madrid [1957].

The work here described on the control of *Earias insulana* (Boisd.) and *Pectinophora gossypiella* (Saund.) on cotton in Spain in 1954 has already been noticed [R.A.E., A **45** 245].

PLANES (S.) & DEL RIVERO (J. M.). **Tres años de experiencias de lucha química contra el barrenador del arroz (*Chilo suppressalis* Wlk. = *simplex* Btlr.).** [Three years of experiments on the chemical control of the rice borer (*C. suppressalis*).]—*Bol. Pat. veg. Ent. agric.* **22** (1955-56) pp. 191-215, 9 figs., 7 refs. Madrid [1957].

Experiments on the control of *Chilo suppressalis* (Wlk.) on rice in Spain [cf. R.A.E., A **45** 287] were continued in 1954-56. In laboratory tests on treated plants, parathion and malathion gave the greatest initial mortality of larvae exposed to the deposits from emulsion sprays, but azinphos-methyl (Gusathion) was more effective than either after a week. Small-scale field tests on the penetration of sprays into the stalks of rice and consequent mortality of larvae in them showed that diazinon, parathion and azinphos-methyl were highly effective and more so than malathion. Mercury-vapour light-traps were again tested for timing control measures [cf. loc. cit.], but the catches could not be counted regularly at short intervals, and it was evident that this was essential. Large-scale field tests on control were carried out with sprays applied from ground machines and dusts from aeroplanes. In the ground tests, DDT and parathion were the most effective of several materials applied twice in emulsion sprays in 1954, but azinphos-methyl and diazinon were the best of several applied once in 1956. In the aerial spray tests, dusts of 10 per cent. BHC or 5 or 10 per cent. DDT gave fair control.

DOMÍNGUEZ GARCÍA-TEJERO (F.). **Rinquitinos de interés agrícola.** [Rhynchitinae of agricultural interest.]—*Bol. Pat. veg. Ent. agric.* **22** (1955-56) pp. 233-277, 21 figs., 4 pp. refs. Madrid [1957].

Accounts are given of the morphology, distribution, food-plants, bionomics and control of the weevils of the subfamily Rhynchitinae that are injurious to cultivated plants in Spain. They include not only several species of *Rhynchites* that damage fruit trees, but also *Byctiscus betulae* (L.), a pest of vines.

DEL CAÑIZO (J.). **Parásitos de la langosta en España. II. Los Trichodes (Col. Cleridae).** [Parasites of the locust in Spain. II. *Trichodes* spp.]—*Bol. Pat. veg. Ent. agric.* **22** (1955-56) pp. 297-312, 6 figs., 32 refs. Madrid [1957].

In this part of a series [cf. *R.A.E.*, A **34** 265], information is given on the morphology of the adults and larvae, the bionomics and the distribution of the Clerids, *Trichodes ammios* (F.) and *T. flavocinctus* Spin., the larvae of which are among the most effective natural enemies of the eggs of *Dociostaurus maroccanus* (Thnb.) in Spain, together with notes on a few other insects of similar habit.

DEL RIVERO (J. M.). **El ácaro de las yemas de los agrios (Aceria sheldoni Ewing).** [The *Citrus* bud mite (*A. sheldoni*).]—*Bol. Pat. veg. Ent. agric.* **23** (1957-58) pp. 31-41, 9 figs., 12 refs. Madrid, 1959.

In 1953, lemon fruits from Malaga were found to have been injured by *Aceria sheldoni* (Ewing), notes on the distribution, habits and control of which are given.

MENDES FERRÃO (J. E.). **A Hoplocampa brevis Klug, contribuição para o seu estudo em Portugal.** [A contribution to the study of *H. brevis* in Portugal.]—*Brotéria* **54** no. 1-2 pp. 30-92, 2 pls., 1 graph, 80 refs. Lisbon, 1958. (With a summary in English.)

An insect causing young pear fruits to drop in Portugal was identified as *Hoplocampa brevis* (Klug), which was previously unknown there. All stages of this sawfly are described. In studies on its bionomics, adults were observed at the end of March, in the flowers, in which eggs were laid. The larvae hatched in 6-10 days and entered the young fruits, in which they fed. They later migrated to others, each attacking about three, and pupated in the soil after a development period of 20 days. The pupae overwintered. Methods of control are reviewed.

GROBLER (J. H.). **Some aspects of the biology, ecology and control of the pine brown tail moth, *Euproctis terminalis*, Walk.**—[1+] ii+186 pp., 142 figs. (2 col.), 2 fldg. tables, 81 refs. Pretoria, Dep. Agric. S. Afr., 1957. (With a summary in Afrikaans.)

The following is based largely on the author's summary of this account of investigations in South Africa on the bionomics and distribution of *Euproctis terminalis* Wlk., which has become an important pest of introduced pines (*Pinus* spp.) [cf. *R.A.E.*, A **28** 403; **29** 18], its relation to its environment and natural enemies [cf. **28** 404; **29** 18; **37** 170], its effect on

the timber yield of *P. patula*, and chemical control [cf. 28 405; 30 33]. All stages and the genitalia of the Lymantriid are described in detail, and its distribution is mapped from data based on collections in South African museums and the British Museum. It appears to be limited to areas with an annual rainfall of at least 725 mm.; its probable western limit, determined from climatic studies and laboratory experiments on the influence of temperature and relative humidity on larval development, is indicated, and its absence elsewhere in the Union is discussed in the light of the findings. Studies on the combined effect of relative humidity and temperature on adult survival and the development of the eggs in the laboratory, the effect of climate, especially temperature, on larval coloration, and the effect of temperature and relative humidity on the duration of the pupal stage in the field are recorded, and a key for the separation of the larval instars, based chiefly on colour characters, is included.

Observations on the movements of the larvae are discussed with reference to survival. It was found that there is no mass migration of the adults from defoliated to undefoliated areas of a plantation as is commonly believed. In extensive surveys, 11 native food-plants were discovered and these, with the introduced ones, are listed. Of the latter, the most important are *P. patula* and, to a less extent, *P. leiophylla* and *P. radiata*. A method of assessing larval populations, making use of a graph derived from the numbers of severed needles and faecal pellets that fall from infested trees on to a given area over a given period and the average temperature during that period, is described.

From a review of outbreaks in plantations of introduced trees, it is deduced that, in any particular section of a plantation, outbreaks occur in cycles of about 6-8 years. The various factors that together constitute the environmental resistance to *E. terminalis* and serve to control it are analysed for the areas of its range in which numbers are always low (the natural habitat), for those in which it is always noticeably present but in which outbreaks do not occur, and for those in which there are regular outbreaks. In the last, populations are affected by various parasitic insects and fungi. Information is given on the bionomics and the morphology of the immature stages of the chief insect parasites, which are *Telenomus phegeus* Nixon, *Meteorus trilineatus* Cam., *Tachina fallax* Mg. and *Pimpla bicolor* Brullé. Insects are of minor importance, however, and the main control agent is a strain of the fungus *Entomophthora (Empusa) grylli*, though this is effective only when host populations become very high and have caused heavy defoliation. The direct loss of timber increment resulting from total defoliation was determined in a plantation of *Pinus patula* by volumetric analysis of trees that had been totally denuded a few years previously, and from this result and the known area (6,360 acres) over which complete defoliation had occurred during the 25 years since *Euproctis* first damaged the plantation, the total loss due to it was estimated at 1,692,396 cu. ft. The loss in height due to defoliation in 1948-49 was assessed at 2.38 ft. per tree.

Since the natural enemies of *E. terminalis* are unable to prevent complete defoliation in all plantations and losses are sufficiently high to justify chemical control, various dusts, all applied at a rate equivalent to 7 lb. per acre, were tested against fourth- and sixth-instar larvae in the laboratory. On the basis of the results, 2 per cent. parathion and 5 per cent. EPN are recommended against larvae of all ages and 5 per cent. malathion against those in the first four instars. These were superior to 5 per cent. DDT, 20 per cent. toxaphene, 10 per cent. Strobane and 2.5 per cent. dieldrin, which, however, all gave fair control of larvae in the first four instars; 2.5 per cent. aldrin was rather ineffective.

GILIOMEE (J. H.). **Grain stink-bug can be controlled effectively.**—*Fmg in S. Afr.* 35 no. 3 pp. 47–48, 2 figs. Pretoria, 1959.

Blissus (Ischnodemus) diplopterus Dist. has recently caused severe injury to wheat in parts of the western Cape Province of South Africa, sucking the sap from the young plants and the developing grains of older ones. The adults of this Lygaeid leave their summer shelters and congregate on the wheat as soon as it emerges from the soil. Eggs are laid from the end of August, or earlier in warmer areas, inside the leaf sheath in masses of 14–25, the females laying 50–150 each. The nymphs hatch in a month and give rise to adults in six weeks, both stages occurring together in large numbers. The adults fly at temperatures above 70°F. and move to shelters when the wheat ripens; some shelter in the stalk cavities of fruits and some under plants or in thatch. In a test, a dieldrin emulsion spray gave good control; it should be applied when the insects have reached the plants but have not yet oviposited.

NYE (I. W. B.). **The insect pests of graminaceous crops in East Africa. Report of a survey carried out between March 1956 and April 1958.**—*Colon. Res. Stud.* no. 31, iii+48 pp., 24 figs., 4 pp. refs. London, Colon. Off., H.M.S.O., 1960. Price 10s. 6d.

This report is based on field investigations and the literature and consists of short general accounts of the survey methods used and of the graminaceous crops of East Africa and their insect pests, followed by a major section on Lepidopterous stalk borers [cf. *R.A.E.*, A 46 303], which are the most important of the pests, and shorter ones on shoot flies, root and shoot feeders, leaf and stalk feeders and seed feeders, including insects that infest stored grain.

The section on stalk borers, in which *Busseola sorghicida* Thurau [9 432] is stated to be a synonym of *B. fusca* (Fuller), and *B. segeta* Bowden [44 465] and *Sesamia botanephaga* Tams & Bowden [41 69] are made subspecies of *B. phaia* Bowden and *S. nonagrioides* (Lef.), respectively, includes information on resting stages, alternative food-plants, natural, cultural and chemical control, and the separation of immature stages, together with detailed discussions of the principal forms. These include *B. fusca*, in Kenya, Uganda and Tanganyika, chiefly in maize and sorghum; *B. phaia phaia*, in Northern Rhodesia and Tanganyika, chiefly in *Pennisetum purpureum*; *B. p. segeta*, in Uganda and Tanganyika, in *P. purpureum* and *Panicum maximum*; *S. calamistis* Hmps., in Kenya, Uganda and Tanganyika, in rice, *Eleusine coracana* (finger millet), sorghum, maize and other plants; *S. poephaga* Tams & Bowden, in Kenya, Uganda and Tanganyika, in maize, sorghum and other plants; *S. n. botanephaga*, in Kenya and Uganda, in maize, sorghum and other plants near swampland; *S. cretica* Led., in northern Kenya, in sorghum; *Chilo zonellus* (Swinh.), in Kenya, Uganda and Tanganyika, in maize, sorghum, *E. coracana*, *Pennisetum typhoides* (bulrush millet) and other plants; *Chilotraea argyrolepia* (Hmps.), in Kenya and Tanganyika, in maize and sorghum; *Maliarpha separatella* Rag., in Kenya, Uganda and Tanganyika, in rice; and *Eldana saccharina* Wlk., in maize and sorghum in western Uganda and sugar-cane (once only) in Tanganyika. For most or all of these, notes are given on morphology, distribution in Africa (with maps) and elsewhere, life-history, food-plants, parasites and chemical control. *S. penniseti* Tams & Bowden, which was described from Ghana [41 69], was found in small

numbers in Uganda, and *S. poecbora* Tams & Bowden, which was also found there, may prove to be conspecific with it; both were reared from *P. purpureum*.

It was found that the larvae of *B. fusca* enter a facultative diapause when the stems in which they are feeding become dry, and that those of *Chilo zonellus* also do so under very severe conditions. The diapause is terminated at the onset of the rainy season. This leads to a mass appearance of *B. fusca*, whereas *C. zonellus*, which usually continues to breed during the dry season, gives rise to adults over an extended period; this is of importance in planning control measures.

SALMOND (K. F.). **A guide to the safe storage of maize.**—*Agric. Bull. Dep. Agric. N. Rhod.* no. 16, iii + 44 pp., 12 figs., 9 refs. Lusaka, 1959.

This bulletin on the storage of maize in Northern Rhodesia includes sections on the more important insects that infest the stored grain in central Africa and their control.

DELATTRE (R.). **Les parasites du cotonnier à Madagascar.**—*Cot. et Fibr. trop.* 13 fasc. 3 pp. 335–352, 17 pls. (3 col.), 1 fig. Paris, 1958.

A table is given permitting the identification of the principal arthropod and other pests of cotton in Madagascar from the type of injury caused, followed by a list of the pests, showing the parts attacked, and by illustrations of many of them.

ILERİ (M.). **Çukurova pamuklarında zararlı yeşil kurt (*Heliothis obsoleta* F.)'nın yaşayışı, salgınlaşması ve önlenme çareleri üzerinde araştırmalar.** [Investigations on the bionomics, ecology, epidemiology and control of *H. armigera*, a harmful pest of cotton in Çukurova.]—*Ankara Zir. Mücad. Enst. Müd.* no. 16, 64 pp., 20 figs., 1 fldg. table, 30 refs. Ankara, 1960. (With a summary in English.)

Vigorously growing late-sown cotton in the district of Çukurova, Turkey, is damaged in June–July by *Heliothis armigera* (Hb.) (*obsoleta*, auct.), which is favoured by the occurrence of continual night dews and other ecological factors, including spring flooding. The damage has been reduced by the introduction of a drainage system and early sowing, but the former has resulted in an increase in infestation by *Earias insulana* (Boisd.) and *Pectinophora (Platycdra) gossypiella* (Saund.), as a result of greater winter survival, and these now require chemical control. Some local flooding at particular seasons is therefore recommended.

ANANTH (K. C.) & RAMACHANDRAN (P. K.). **Tender berry borer.**—*Indian Coff.* 23 no. 4 pp. 168–169, 1 ref. Bangalore, 1959.

Homona coffearia (Nietn.), which is usually only a minor pest of coffee in India, caused much damage in the Pulneys district in 1957–58 and 1958–59. The larvae of this Tortricid roll the leaves and attack the tender berries, emptying the seeds developing in them. Observations showed that they preferred shaded areas and did not attack the berries after the

beginning of the north-east monsoon in September, when hardening began, though they continued to feed on the leaves. Other plants were also infested. It is recommended that shade should be reduced and parathion (Folidol E.605) added to the spray of bordeaux mixture applied in June-July, since it gave good control when applied at 2 oz. per 40 gal. water.

DE FLUITER (H. J.). **Krankheiten und Schädlinge.** [Diseases and pests.] [*In*] VON BERNEGGER (S.). **Tropische und subtropische Weltwirtschaftspflanzen.** III. Teil. Band 2. Kaffee. (2. Aufl. herausg. von C. Coolhaas.) [Tropical and subtropical world crops. Part 3. Vol. 2. Coffee. (2nd edn. edited by C. Coolhaas.)]—pp. 96-182, 22 figs., 5 pp. refs. Stuttgart, F. Enke Verlag, 1960.

Notes are given (pp. 132-177) on the habits, distribution, natural enemies and control of the insects and mites injurious to coffee throughout the world.

GHANI (M. A.). ***Sylepta derogata* (Fabricius) and possibilities of its biological control in Pakistan.**—[4+] 42 pp., frontis., 4 fldg. tables, 187 refs. Farnham Royal, Bucks., Commonw. agric. Bur., 1960. Price 5s. Od.

Sylepta derogata (F.) is an important pest of cotton in both parts of Pakistan and also infests wild plants in the forest, which serve as a constant source of infestation. Chemical control is employed but is expensive, and the practicability of biological control was therefore investigated. In this paper, the morphology of all stages of the Pyralid, its life-history and its distribution, food-plants and natural enemies in Pakistan and the world are reviewed and the distribution, food-plants and parasites of other species of *Sylepta* are shown in a table. In a discussion of the possibilities, the increased use of indigenous parasites against *S. derogata* is considered practicable, 16 parasites of it that might prove suitable for introduction are listed and two parasites of other species of *Sylepta* in other countries are singled out as worth investigation. Of all these, the four most promising are *Meteorus japonicus* Ashm. and *Brachymeria obscurata* (Wlk.), which occur in China and the second also in Fiji and the Philippines, *Pediobius* (*Pleurotropis*) sp., which occurs in the Philippines, and *Ptychomyia remota* Aldr., which is known in Burma, India, Java, and Malaya; all parasitise *S. derogata* in those countries.

SANDERMANN (W.) & DIETRICH (H. H.). **Untersuchungen über termite-resistente Hölzer.** [Investigations on termite-resistant species of wood.]—*Holz a. Roh- u. Werkst.* 15 no. 7 pp. 281-297, 21 figs., 63 refs. Berlin, 1957. (With a summary in English.)

The following is based on the authors' summary. Some 200 species of trees of which the wood is resistant to termites have been recorded in the literature, and the resistance is attributed to chemical components having a repellent or toxic effect. In tests with *Reticulitermes lucifugus* (Rossi) in Germany, 25 selected exotic species were investigated and about half proved highly resistant. Seven species not previously known to be resistant are noted. Of the compounds extracted and found effective against the termite, most were stilbenes, quinones or pyran derivatives.

QUEDNAU (W.). **Radioaktive Markierung von Schlupfwespen.** [Radioactive labelling of Hymenoptera.]—*Atompraxis* **6** pt. 10–11 pp. 427–431, 7 figs., 8 refs. Karlsruhe, 1960. (With summaries in English & French.)

Details are given of experiments in which *Aphidius* parasitising *Macrosiphum* was rendered radioactive by using lucerne standing in a nutrient solution containing radioactive phosphorus (^{32}P) as the food-plant and *Trichogramma* adults were rendered radioactive by feeding on honey containing ^{32}P ; eggs in which these adults had oviposited and the parasites that emerged from them also showed radioactivity.

SAKAI (S.). **Insect toxicological studies on the joint toxic action of insecticides.** [In Japanese.]— $10\frac{1}{4} \times 7\frac{1}{2}$ in., [1+] iii + 479 pp., 67 figs., 573 refs. Tokyo, 1960. (With a summary in English, pp. 425–479.)

In the first sections of this book, the author briefly reviews the literature on the synergism arising from the combination of insecticides with various other materials, offers a revised definition of joint toxic action to include pseudo-synergism, subdivides true and pseudo-joint toxic action into numerous categories, and provides a mathematical interpretation of them. In the later ones, he deals with joint toxic action from the standpoints of the quantal response and the continual reactions of individual insects observed in experiments with various species and discusses biological, physical and chemical factors influencing it. In the last section, he summarises the results of numerous tests as regards the practical control of insect pests.

PAPERS NOTICED BY TITLE ONLY.

BEINGOLEA G. (O.). **Resistencia de los insectos a los insecticidas, con ejemplos en el Perú.** [Resistance of insects to insecticides, with examples in Peru (a review of the literature).]—*Rev. peruana Ent. agric.* **1** no. 1 pp. 51–58, 41 refs. Lima, 1958.

RUSSO (G.) & SANTORO (R.). **Esperimenti di lotta antidacica eseguiti in Ascea Marina (Salerno) nel 1955.** [Experiments on the control of *Dacus oleae* in Ascea Marina (Salerno) in 1955.]—*Ann. Sper. agr.* (N.S.) **12** no. 1 pp. 333–385. Rome, 1958. (With a summary in English.) [See *R.A.E.*, A **47** 359.]

BÜNZLI (G. H.) & BÜTTIKER (W. W.). **Insects in Southern Rhodesian tobacco culture. Part V. Insects occurring in the fields. Coleoptera, Neuroptera, Rhynchota and Arachnoidea.**—*Acta trop.* **15** no. 4 pp. 357–366, 38 refs. Basle, 1958. [Cf. *R.A.E.*, A **47** 499.]

LINNAUVORI (R.). **Insects of Micronesia. Vol. 6 no. 5. Homoptera: Cicadellidae.**—pp. [5+] 231–344, 54 figs., 1 map. KATO (M.). **Homoptera: Membracidae.**—pp. [5+] 345–351, 2 figs., 1 map. Honolulu, Bishop Mus., 1960. [Cf. *R.A.E.*, A **43** 345; **48** 448.]

THE INSECT PESTS OF COTTON IN TROPICAL AFRICA

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